SOUTHWEST FISHERIES SCIENCE CENTER

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SUMMARY OF THE 1999 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES

By

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ADMINISTRATIVE REPORT LJ-00-06

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INTRODUCTION

Albacore (*Thunnus alalunga*) are commercially harvested in the North Pacific by fisheries from various nations (Table 1). Japan is the largest harvester, annually taking 74% of the total amount of North Pacific albacore landed by all nations, while the U.S. annually takes less than 22%. U.S. troll vessels have fished for albacore in the North Pacific since the early 1900's (Clemens and Craig, 1965). The collection of logbook and length-frequency data from the U.S. North Pacific albacore troll fishery began in 1951. The agencies currently involved in the collection of voluntary logbook, length-frequency, and catch information from the U.S. Pacific albacore troll fisheries are the National Marine Fisheries Service (NMFS), Southwest Fisheries Science Center (SWFSC, La Jolla and Honolulu laboratories), Western Fishboat Owners Association (WFOA), American Fishermen's Research Foundation (AFRF), Pacific States Marine Fisheries Commission (PSMFC), and the state fisheries agencies of California, Oregon, and Washington. Beginning in 1971, cooperative surveys between NMFS and AFRF led to the expansion of areas fished by U.S. troll vessels to areas north of Hawaii and west of the International Dateline (Laurs, Lynn, and Nishimoto, 1975). In recent years, the North Pacific albacore troll season has begun as early as mid-April in areas northwest of Midway Island. In July and August, the fleet moves eastward, fishing near 45°N, 150°W and along the west coast of North America from Vancouver Island to southern California. Fishing can continue into November if weather permits and sufficient amounts of albacore remain available to troll gear.

Albacore are also harvested in the South Pacific by a variety of nations (Table 2). Japan harvests the largest proportion of the total amount of albacore caught annually in the South Pacific (41% on average). The U.S. annually takes approximately 2% of the total catch of South Pacific albacore. Exploratory fishing for albacore with troll gear in areas east of New Zealand in 1986 resulted in the expansion of the U.S. albacore troll fishery to the South Pacific (Laurs et al., 1987). The collection of logbook, catch, and length-frequency data from the U.S. South Pacific fishery began in 1987. This fishery takes place during the austral summer months (November through April). The U.S. troll vessels that participate in the South Pacific fishery depart from the U.S. west coast or Hawaii after the end of the North Pacific season and travel to American Samoa or French Polynesia to prepare for the South Pacific season. South Pacific albacore

fishing areas extend from the Tasman Sea to approximately 110°W between 25°S and 45°S. At the end of the season (in March or April), most troll vessels unload in American Samoa, Fiji, or Tahiti then travel to Hawaii or the U.S. west coast to prepare for the next North Pacific fishing season.

This report presents summaries of the logbook (daily catch and effort), catch and length-frequency information collected from the U.S. fleet during the 1999 North Pacific and the 1998-99 South Pacific albacore seasons. Data from the 1998 North Pacific season, 1997-98 South Pacific season, and from other fisheries (where available) are included for comparison.

DATA COLLECTED

Total annual catch data from the various fisheries that harvest albacore in the Pacific Ocean are available from 1952 to 1999 (Tables 1 and 2). Data from landings and at-sea transshipments are provided by WFOA and are collected from state landing receipts submitted by fish buyers and canneries. Daily catch and effort data are obtained from completed copies of the *U.S. Pacific Albacore Logbook*, which are voluntarily submitted by fishermen, or completed by port samplers who collect the information from cooperating fishermen. Beginning in 1999, U.S. albacore fishermen that fish outside 200 nautical miles of the Pacific coast of the U.S. are required by the High Seas Fishing Compliance Act (HSFCA) to submit a logbook to NMFS. The *U.S. Pacific Albacore Logbook* has been revised to permit recording of fishery data related to the HSFCA (e.g. bycatch and catch discards). Approximately 1,300 logbooks were distributed to fishermen for the 1999 North Pacific and the 1998-99 South Pacific albacore seasons. Samplers in the ports of Ilwaco, Washington; Newport, Oregon; Terminal Island, California; and Pago Pago, American Samoa collected voluntary logbook data and length-frequency data during the 1999 North Pacific season. Samplers in Pago Pago collected voluntary logbook data and length-frequency data during the 1998-99 South Pacific season.

North Pacific sea surface temperature (SST) data recorded from commercial transport ships, fishing vessels, and research vessels were obtained from the National Weather Service's National Centers for Environmental Prediction (NCEP) for each month of the North Pacific albacore season. These data were compiled into monthly averages and computer-analyzed at the SWFSC La Jolla laboratory. Contours of SSTs (isotherms) were computer-drawn with a resolution of 1° of latitude and longitude and compared with the general catch areas of North Pacific albacore (Figures 2a through 2f). Analysis of SSTs shows the distribution of isotherms and the locations of temperature fronts (areas of closely-spaced isotherms). Albacore tend to congregate along these fronts in the North Pacific transition zone (Laurs and Lynn, 1977). Currently, there is insufficient SST information available from the areas of the South Pacific fishery (east of New Zealand to 110°W and south of 30°S) to make a similar analysis possible.

TOTAL CATCH AND EFFORT

Total catch from the 1999 U.S. North Pacific albacore troll fishery decreased to 11,169 metric tons (t) from 14,025 t landed in 1998. An estimated 775 troll vessels fished in the 1999 North Pacific fishery. This is a 13% decrease from 892 troll vessels that fished in 1998. Fishing effort in the albacore troll fisheries is measured in number of fishing days. The total number of fishing days is estimated by the following equation:

$$Effort(days) = Catch(pounds) \div [CPUE(^{fish}/_{day}) \times AverageWeight(^{pounds}/_{fish})]$$

U.S. troll vessels fished 35,249 days during the 1999 North Pacific albacore season, an 85% increase from 19,100 days fished in 1998 (Table 3). Marketing problems in the 1998 North Pacific fishery caused many vessels to remain in port for extended periods of time, reducing the total effort for the 1998 season. Forty-two trips (of 345 sampled trips) recorded a total of 2,415 albacore that were discarded during the 1999 North Pacific troll season. Albacore may be discarded because they are under-sized, damaged, or become spoiled due to refrigeration problems. Albacore troll vessels catch minor amounts of other fish species, usually while in transit to or from the fishing grounds. The primary species caught incidentally include skipjack tuna (*Katsuwonus pelamis*), bluefin tuna (*Thunnus thynnus*), mahi mahi (*Coryphaena hippurus*), billfish, and sharks.

The South Pacific albacore troll fishery begins in November or December and continues into April of the following year. As a result, season totals may differ slightly from annual totals. Total catch by U.S. troll vessels in the 1998-99 season decreased to 1,200 t from 1,764 t landed in 1997-98. Twenty troll vessels participated in the 1998-99 South Pacific season compared to 37 vessels that fished in the 1997-98 season. Total fishing effort for the 1998-99 South Pacific albacore season is estimated to be 2,166 days, a decrease of 60% from 5,379 days fished in the 1997-98 season (Table 4).

DISTRIBUTION OF CATCHES AND SSTs

Albacore catches recorded during the 1999 North Pacific albacore troll season extend from the west coast of the U.S. to 166°E, between approximately 30°N and 50°N (Figure 1). Areas of high catch indicate productive regions where albacore are available to troll gear. Based on sampled logbook data, high catch areas ranged from 31°N to 47°N, between 118°W and 126°W along the U.S. west coast. Fishing areas off southern California in the 1999 season were the most productive since 1989 when the traditional high catch areas shifted from southern California waters to areas off Oregon, Washington, British Columbia, and offshore areas west of 130°W. High and low catch areas for each month of the 1999 North Pacific troll season are shaded on corresponding charts of SST contours in Figures 2a through 2f. These figures show the relationship between catch areas, SST fronts, and isotherm distribution patterns. High catch areas in May were in normal SSTs that ranged from 21°C to 23°C (70°F to 73°F, Figure 2a). "Normal" refers to the long-term mean averaged over the past 20 years. The areas of highest catch in June were in SSTs that were (on average) 1°C below normal, ranging from 15°C to 19°C (59°F to 67°F, Figure 2b). During July, the most productive fishing occurred in SSTs that were 2°C below normal, ranging from 14°C to 18°C (57°F to 65°F, Figure 2c). The highest catches in August were along the coast in SSTs that were 1°C to 2°C below normal, ranging from 14°C to 18°C (57°F to 65°F). In the southern coastal areas SSTs were 1°C below normal. In September, high catch areas along the coast were in SSTs ranging between 14°C and 19°C (57°F and 67°F, respectively). These SSTs were 1°C below normal (Figure 2e). An offshore area stretching from 178°W to 179°E between 41°N and 43°N was also highly productive in September. SST's in this area ranged from 17°C to 19°C (63°F to 67°F) and were 1°C below normal. In October the area of highest catch was in 15°C to 18°C (59°F to 65°F) water, which

was 1°C below normal (Figure 2f). High catches were also recorded offshore at 40°N, 171°W, where SSTs were normal and ranged from 16°C to 18°C (61°F to 65°F).

Albacore catches recorded during the 1998-99 South Pacific season were summarized by season and month in 5° squares of latitude and longitude (Figures 3a through 3f). The highest albacore catches of the season were made between 35°S and 45°S, from 150°W to 160°W (Figure 3a). High catch areas shifted to the southeast as the season progressed.

CATCH-PER-UNIT EFFORT

Catch-Per-Unit Effort (CPUE) is used as an indication of relative abundance of albacore available to troll gear, or a measure of fishing success, and is expressed in numbers of fish caught per day of fishing. Catch (in numbers of fish) and effort (in days fished) were summarized from logbook data by 10-day, 1°-square strata in which there was at least one day of fishing effort (Kleiber and Perrin, 1991). Average CPUE is calculated as follows:

$$Average\ CPUE = \frac{\sum_{i=1}^{n} \frac{C_i}{E_i}}{n}$$

Where C_i is the total sampled catch in the i^{th} stratum, E_i is the total sampled effort in the i^{th} strata, and n is the total number of strata.

The CPUE for the North Pacific albacore troll fishery declined by approximately 68% between 1962 and 1977, then remained relatively stable between 1977 and 1989 (Figure 4). The CPUE has been generally increasing since 1989 with large fluctuations between 1995 and 1999. The average CPUE for the 1999 North Pacific season is 40 fish per day, a sharp decrease from 113 fish per day in the 1998 season (Table 3). The reduced effort caused by marketing problems in the 1998 North Pacific season may have biased CPUE estimates for that season.

The CPUE for the U.S. South Pacific albacore troll fishery generally declined between 1987 and 1993 (Figure 4). The CPUE then peaked at 150 fish per day in 1995 and has remained relatively stable since 1996. The CPUE for the 1998-99 South Pacific season is 77 fish per day, a 45% increase from 53 fish per day in the 1997-98 season (Table 4).

The CPUEs from the 1999 North Pacific season were averaged by season and month in 1° squares of latitude and longitude. The highest CPUEs for the season ranged from 92 to 638 fish per day and were scattered between 29°N and 48 °N, from 116°W to 173°W (Figure 5a). The area from 39°N to 44°N, between 178°W and 170°E had a more concentrated distribution of high catch rates. In May and June, high CPUEs were sparsely scattered along 35°N between 140°W and 170°E (Figures 5b and 5c). High CPUEs in July were sparsely distributed along the U.S. west coast from 29°N to 49°N and extended offshore to 161°W (Figure 5d). CPUEs in southern California waters increased in July. From August through October, high CPUEs were more concentrated along the coast (Figures 5e through 5g). In September and October, an area of high CPUEs developed near 40°N and the International Dateline.

The CPUEs for the 1998-99 South Pacific season were averaged by season and month in 5° squares of latitude and longitude. The highest CPUEs for the 1998-99 season ranged from 87 fish per day to 127 fish per day and were distributed from 35°S to 45°S, between 130°W and 165°W (Figure 6a). High CPUEs in December 1998 and April 1999 were confined to a few 5° squares as troll vessels moved into and out of the fishing grounds (Figures 6b and 6f, respectively). High CPUEs were more dispersed between January and March (Figures 6c through 6e). At mid-season (February), CPUEs were highest from 35°S to 45°S, between 150°W and 165°W (Figure 6d).

LOGBOOK SAMPLING COVERAGE

Logbook sampling coverage is expressed as the ratio of catches from sampled trips (those trips from which logbook data were received) to total catches. Catches from sampled trips in some past seasons are not available. For consistent comparison of sampling coverage between current and past seasons, sampled catches are estimated by multiplying numbers of fish caught (recorded in logbooks) by the average weight of those fish and summing these estimates from sampled logbooks.

A total of 345 trips (of 2,660 total trips) were sampled for logbook information during the 1999 North Pacific albacore troll season. Sampled catches total 3,464 t, resulting in a logbook sampling coverage rate of 31% compared with 38% in 1998 (Table 3).

Logbook data from the 1998-99 South Pacific albacore troll season were collected from 13 of the 24 trips made by U.S. vessels. These sampled trips caught 629 t, resulting in a logbook sampling coverage of 52%, compared to 68% for the 1997-98 season (Table 4).

LENGTH-FREQUENCY COMPOSITION

Fork lengths of albacore measured during the 1999 North Pacific season ranged from 47 cm (5 lb or 2.1 kg) to 106 cm (54 lb or 24.3 kg) and averaged 73 cm (18 lb or 8 kg, Figure 7). The average fork length of sampled albacore from the 1998 season is 68 cm (14 lb or 6.4 kg). Two length-frequency modes are evident in the histogram of samples from the 1999 North Pacific season. The most prominent mode is centered near 75 cm (19 lb or 8.6 kg). A less prominent mode is centered at 65 cm (12 lb or 5.6 kg). The ages of albacore taken in both the North and South Pacific troll fisheries range from three to five years old. Length-age and length-weight relationships for North Pacific albacore are taken from Bartoo and Forman, 1993. Length-age relationships for South Pacific albacore are taken from Labelle et al., 1993.

Small albacore (less than 49 cm fork length or 5 lb) may not be adequately represented in the length-frequency data collected from the 1999 North Pacific fishery. Vessels that sell most of their catch to canneries or buying stations (which may pay less for small fish) might discard small fish when they are abundant in the catches. Troll vessels that sell their fish to markets where small fish are preferred might retain more small fish. These fish are usually not available to port samplers.

Albacore that were measured during the 1998-99 South Pacific season ranged from 50 cm (6 lb or 2.6 kg) to 94 cm (37 lb or 17 kg) and average 70 cm (15.5 lb or 7 kg, Figure 8). The

average fork length of sampled albacore from the 1997-98 season is 67 cm (14 lb or 6.2 kg). Two distinct length-frequency modes are apparent in the histogram of fish sampled in the 1998-99 season. The first is centered at 62 cm (11 lb or 4.9 kg). Another, more prominent mode is centered at 71 cm (16 lb or 7.3 kg).

LENGTH-FREQUENCY SAMPLING COVERAGE

Length-frequency sampling coverage is expressed as the ratio of the number of fish measured to the total number of fish landed for the season. The total number of fish landed for the season is estimated by dividing total catches by the average weight of fish landed. During the 1999 North Pacific season 15,278 albacore were measured, resulting in a length-frequency sampling coverage of 1.1%, compared with 0.8% for the 1998 North Pacific season (Table 3).

Port samplers in Pago Pago measured 790 of the estimated 167,839 albacore landed during the 1998-99 South Pacific albacore fishery. The length-frequency sampling coverage rate for the 1998-99 season is 0.5% compared to 0.1% for the 1997-98 season (Table 4).

SUMMARY

The 1999 U.S. North Pacific albacore troll fishery was not as productive as the 1998 fishery. Seven hundred, seventy-five vessels landed 11,169 t during the 1999 season compared to 892 vessels that landed 14,025 t in 1998, a 20% decrease in total catch. Total effort increased 85% from the 1998 fishing season. The average CPUE for the 1999 North Pacific season decreased 65% from 113 fish per day in 1998 to 40 fish per day. The most productive catch areas shifted southeast to the waters off southern California, where high catches have not been made since 1989. The average fork length of sampled albacore increased to 73 cm (18 lb or 8 kg) from 68 cm (14 lb or 6.4 kg) in 1998; however, fish less than 49 cm fork length (5 lb or 2.3 kg) may not be adequately represented in the North Pacific length-frequency samples due to discarding of small fish or marketing practices that prohibited sampling them. Logbook sampling coverage for the North Pacific albacore fishery decreased to 31% from 38% in 1998. Port sampling of the 1999 U.S. North Pacific fishery was hampered again in 1999 by funding constraints. The shift of productive fishing areas from the High Seas (where logbooks are required from U.S. vessels) to areas within the U.S. Exclusive Economic Zone (where logbooks remain voluntary) may have influenced the return of voluntary logbooks. Length-frequency sampling coverage increased to 1.1% in 1999 from 0.8% in 1998.

Total catch from the 1998-99 South Pacific season is 1,200 t, a decrease of 32% from 1,764 t landed in the 1997-98 season. Twenty U.S. troll vessels fished 2,166 days in the 1998-99 season compared to 37 vessels that fished 5,379 days in the 1997-98 season. The CPUE for the 1998-99 season increased 45% to 77 fish per day, compared to 53 fish per day in the 1997-98 season. Though total catch was reduced, fewer vessels expended less effort and had significantly higher catch rates during the 1998-99 season. The average size of albacore measured during the 1998-99 season increased to 70 cm (16 lb) from 67 cm (14 lb) in the 1997-98 season. Logbook sampling coverage for the 1998-99 South Pacific albacore troll fishery decreased from 68% in the 1997-98 season to 52%. Length-frequency sampling coverage increased from 0.1% in the 1997-98 season to 0.5% in the 1998-99 season.

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Table 1. North Pacific albacore catches (in metric tons) by fisheries, 1952-1999.[1] Provisional estimates in ( ). "--" indicates data not available. "0" indicates less than 1 metric ton.

YEAR	JAPAN[2]					TAIWAN		KOREA[3]	
	GILL NET	LONG LINE	POLE & LINE	PURSE SEINE	OTHER GEAR	GILL NET	LONG LINE	GILL NET	LONG LINE
1952		26,687	41,787	154	237				
1953		27,777	32,921	38	132				
1954		20,958	28,069	23	38				
1955		16,277	24,236	8	136				
1956		14,341	42,810		57				
1957		21,053	49,500	83	151				
1958		18,432	22,175	8	124				
1959		15,802	14,252		67				
1960		17,369	25,156		76				
1961		17,437	18,639	7	268				
1962		15,764	8,729	53	191				
1963		13,464	26,420	59	218				
1964		15,458	23,858	128	319		26		
1965		13,701	41,491	11	121		261		
1966		25,050	22,830	111	585		271		
1967		28,869	30,481	89	520		635		
1968		23,961	16,597	267	1,109		698		
1969		18,006	31,912	521	935		634		
1970		15,372	24,263	317	456		1,516		
1971		11,035	52,957	902	308		1,759		
1972	1	12,649	60,591	277	623		3,091		
1973	39	16,059	68,808	1,353	495		128		
1974	224	13,053	73,576	161	879		570		
1975	166	10,060	52,157	159	228		1,494		2,463
1976	1,070	15,896	85,336	1,109	272		1,251		859
1977	688	15,737	31,934	669	355		873		792
1978	4,029	13,061	59,877	1,115	2,078		284		228
1979	2,856	14,249	44,662	125	1,126		187	0	259
1980	2,986	14,743	46,743	329	1,179	--	318	6	597
1981	10,348	18,020	27,426	252	663	--	339	16	459
1982	12,511	16,762	29,615	561	440	--	559	113	387
1983	6,852	15,103	21,098	350	118	--	520	233	454
1984	8,988	15,111	26,015	3,380	511	--	471	516	136
1985	11,204	14,320	20,714	1,533	305	--	109	576	291
1986	7,813	12,945	16,096	1,542	626	--	--	726	241
1987	6,698	14,642	19,091	1,205	155	2,514	--	817	182
1988	9,074	13,904	6,216	1,208	134	7,389	38	1,016	109
1989	7,437	13,194	8,629	2,521	393	8,350	544	1,023	81
1990	6,064	15,928	8,532	1,995	249	16,701	287	1,016	20
1991	3,401	17,043	7,103	2,652	392	3,398	353	852	3
1992	2,721	19,149	13,888	4,104	1,527	7,866	300	271	43
1993	287	29,616	12,809	2,889	867	0	494	0	43
1994	263	29,612	26,391	2,026	799	0	586	0	43
1995	282	29,080	20,981	1,177	937	0	2,504	0	43
1996	116	32,492	20,272	581	932	0	3,594	(0)	(43)
1997	359	40,711	32,250	1,068	1,708	0	4,199	(0)	(43)
1998	(359)	(40,711)	28,512	879	1,708	0	4,797	(0)	(43)
1999	(359)	(40,711)	(28,512)	(879)	(1,708)	(0)	(4,797)	(0)	(43)

[1] Data are from the 16th North Pacific Albacore Workshop, November 4-6 1999, Kesen-numa, Japan except as noted.

[2] Japanese pole & line catches include fish caught by research vessels. Pole & line and longline catches for 1931-1951 from U.S.F.W.S. Res. Rep. 52. Longline catches for 1952-1960 exclude minor amounts taken by vessels under 20 metric tons. 1991 longline and 1995-1998 catches from M. Ogura, pers. Com.

[3] Korean longline catches calculated from Y. Gong (pers. comm.) using the ratio of catches in numbers, from the North Pacific. Gillnet catches for 1979-1990 are calulated by multiplying the 1991 CPUE (# fish per pok) by effort (# poks) then multiplying by average weight (1991, 1992: 4.13 kg/fish).

Table 1. Continued

YEAR	U.S.[4]							CANADA[5]		MEXICO	GRAND TOTAL
	BAIT BOAT	GILL NET	LONG LINE	PURSE SEINE	SPORT	TROLL	OTHER GEAR	TROLL	PURSE SEINE	OTHER GEAR	
1952			46		1,373	23,843		71			94,198
1953			23		171	15,740		5			76,807
1954			13		147	12,246					61,494
1955			9		577	13,264					54,507
1956			6		482	18,751		17			76,464
1957			4		304	21,165		8			92,268
1958			7		48	14,855		74			55,723
1959			5		0	20,990	5	212			51,333
1960			4		557	20,100	4	5	136		63,407
1961	2,837		5		1,355	12,055	6	4		0	52,613
1962	1,085		7		1,681	19,752	8	1		0	47,271
1963	2,432		7		1,161	25,140	7	5		0	68,913
1964	3,411		4		824	18,388	4	3		0	62,423
1965	417		3		731	16,542	3	15		0	73,296
1966	1,600		8		588	15,333	9	44		0	66,429
1967	4,113		12		707	17,814	12	161			83,413
1968	4,906		11		951	20,434	10	1,028			69,972
1969	2,996		14		358	18,827	12	1,365		0	75,580
1970	4,416		9		822	21,032	9	390		0	68,602
1971	2,071		11		1,175	20,526	11	1,746		0	92,501
1972	3,750		8		637	23,600	8	3,921		100	109,256
1973	2,236		14		84	15,653	14	1,400		0	106,283
1974	4,777		9		94	20,178	9	1,331		1	114,862
1975	3,243		33		640	18,932	43	111		1	89,730
1976	2,700		23		713	15,905	27	278		36	125,475
1977	1,497		37		537	9,969	36	53		0	63,177
1978	950		54		810	16,613	69	23		1	99,192
1979	303		--		74	6,781	31	521		1	71,175
1980	382		--		168	7,556	24	212		31	75,274
1981	748		25		195	12,637	60	200		8	71,396
1982	425		94		257	6,609	84	104		7	68,528
1983	607		6		87	9,359	213	225		33	55,258
1984	1,030		2	3,728	1,427	9,304	138	50		113	70,920
1985	1,498	2	0		1,176	6,415	83	56		49	58,331
1986	432	3			196	4,708	106	30		3	45,467
1987	158	5	149		74	2,766	136	104		7	48,703
1988	598	15	309		64	4,212	318	155		15	44,774
1989	54	4	250		160	1,860	272	140		2	44,914
1990	115	29	168	71	24	2,603	181	302		2	54,287
1991	0	17	313	0	6	1,845	384	139		2	37,903
1992	0	0	332	0	2	4,572	408	363		10	55,555
1993		0	440		25	6,254	331	494		11	54,560
1994	0	38	546		106	10,978	712	836		6	72,942
1995	0	40	880		102	8,200	1,096	1,698		5	67,025
1996	0	38	1,184	11	51	16,346	0	602		21	(76,284)
1997	0	38	1,642	2	744	14,151	0	1,045		53	(98,013)
1998	6	79	1,131	33	1,153	14,025	1	3,034		--	(96,471)
1999	(51)	(108)	(1,526)	(47)	(1,874)	(11,169)	(56)	(3,034)		--	(94,874)

[4] U.S. troll boat catches for 1952-1960 include fish caught by bait boats. U.S. troll boat catches for 1984-1988 include gillnet catches.

[5] 1960 Canadian purse seine catch from Cal. Fish & Game Vol. 48, number 1.

Table 2. South Pacific albacore catches (in metric tons) by fisheries, 1952-1999.[1] Provisional estimates in ( ). "--" indicates data not available. "0" indicates less than 1 metric ton.

YEAR	JAPAN			TAIWAN		KOREA		U.S.		NEW ZEALAND		FRENCH POLYNESIA	
	GILL NET	LONG[2] LINE	POLE & LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	LONG[3] LINE	TROLL[4]	LONG LINE	TROLL	LONG LINE	TROLL
1952		154											
1953		803											
1954		9,578											
1955		8,625											
1956		7,281											
1957		8,757											
1958		18,490					146						
1959		17,385					456						
1960		21,638	45				610						
1961		23,412					330						
1962		34,620					599						
1963		29,120	16		608		1,367						
1964		19,390			629		2,911						
1965		17,793			1,640		6,405						
1966		21,627			6,669		10,817						
1967		15,104			11,497		13,717				5		
1968		6,659			12,254		10,138				14		
1969		4,894			9,503		9,963				--		
1970		5,297			14,484		11,599				50	--	
1971		3,472			15,871		14,482				--	--	
1972		3,027			16,674		14,439				268	--	
1973		2,550			17,741		17,452				484	--	
1974		1,868			16,857		12,194				898	--	
1975		1,333			16,056		9,015				646	--	
1976		2,054			13,206		9,058				25	--	
1977		2,328			21,429		11,229				621	--	
1978		2,845			20,702		11,658				1,686	--	
1979		2,274			14,987		11,411				814	--	
1980		2,216	19		17,998		10,449				1,468	--	
1981		4,203	8		14,390		13,342				2,085	--	
1982		4,899	1		12,634		10,769	0			2,434	--	
1983	32	5,723	2		12,069		7,069	5			744	--	
1984	1,581	3,804			11,155		5,321	9			2,773	--	
1985	1,928	3,868			9,601		13,544	11			3,253	--	
1986	1,936	4,426			11,913		15,877	0	92		1,911	--	
1987	919	4,490			15,009		6,821	0	751		1,227	--	
1988	4,271	7,469		1,000	17,120		6,563	1	3,558		330	--	
1989	13,263	5,828		8,520	10,867	172	5,151	0	3,280	19	5,161	--	102
1990	5,667	6,573		1,859	11,619		3,947	0	3,922	249	2,143	20	299
1991		4,468		1,394	16,508		1,866	1	5,540	325	2,236	100	326
1992		3,814	49		20,956		2,271	0	3,055	706	3,708	195	72
1993		8,381	5		17,701		1,083	0	1,036	221	3,282	714	45
1994		7,151	2		19,731		0	34	530	474	5,094	913	--
1995		6,326			12,775		8	52	2,092	427	5,760	772	184
1996		3,879			11,909		215	99	2,186	480	5,157	1,463	69
1997		4,625	--		15,662		845	271	1,403	323	3,303	2,595	24
1998		4,625	--		15,101		2,680	326	1,764	(323)	(3,303)	3,189	
1999		(4,625)	--		(15,101)		(2,680)	(326)	(1,200)	(323)	(3,303)	(3,189)	(0)

[1] Data are from Twelfth Meeting of the Standing Committee on Tuna and Billfish, 16 June - 23 June 1999 except as noted. All catches are from areas within the SPAR statistical area except as noted.

[2] Japan longline include catches from Australia-Japan joint venture vessels.

[3] 1982 - 1993 United States longline catches from Pelagic Fisheries of the Western Pacific Region 1996 and 1998 Annual Reports.

[4] United States troll catches may include catches from December of the previous year.

Table 2. Continued

YEAR	AUSTRALIA		NEW CALEDONIA	TONGA	FIJI	WESTERN SAMOA	SOLOMON ISLANDS	CHILE[6]	VANUATU	OTHER		GRAND TOTAL
	LONG LINE	TROLL[5]	LONG LINE	LONG LINE	LONG LINE	LONG LINE	LONG LINE	DRIFT NET	LONG LINE	LONG[7] LINE	TROLL[8]	
1952												154
1953												803
1954												9,578
1955												8,625
1956												7,281
1957												8,757
1958												18,636
1959												17,841
1960												22,293
1961												23,742
1962												35,219
1963												31,111
1964												22,930
1965												25,838
1966												39,113
1967												40,323
1968												29,065
1969												24,360
1970		100										31,530
1971		100										33,925
1972		100										34,508
1973		100					4					38,331
1974		100										31,917
1975		100										27,150
1976		100					6					24,449
1977		100					9					35,716
1978		100					9					37,000
1979		100					21					29,607
1980		100					25					32,275
1981		5					2					34,035
1982		6		106			8					30,857
1983		7	12	143			19					25,825
1984		8	112	135			19					24,917
1985	0	9	131	174			12					32,531
1986	0	10	179	206								36,550
1987	129	11	563	252								30,172
1988	107	12	584	242						0	90	41,347
1989	93	13	566	195	3					0	162	53,395
1990	51	15	1,053	152	68					4		37,641
1991	213	20	909	171	208					0	4	34,289
1992	192	70	692	199	243					0	54	36,275
1993	226	55	755	231	463	228				1		34,427
1994	351	70	840	343	586	641				29	128	36,918
1995	401	25	332	379	665	1,883	161	15	112	43	121	32,533
1996	408	(25)	414	494	1,024	2,470	1,154	(21)	287	49	215	(32,018)
1997	302	(25)	267	(494)	1,197	4,387	608	(0)	17	101	356	(36,805)
1998	480	(35)	860	(494)	1,207	6,508	370	(0)	(17)	36	294	(41,613)
1999	(480)	(35)	(860)	(494)	(1,207)	(6,508)	(370)	(0)	(17)	(36)	(129)	(40,883)

[5] Australia troll 1970 - 1980 are incidental catches from pole-and-line vessels targeting southern bluefin tuna. 1981-1998 include recreational catches.

[6] Chile gill net catches from R. Serra (pers. comm.).

[7] Other includes Cook Islands, Papua New Guinea, and China. China longline catches from SPC Tuna Fishery Yearbook 1997.

[8] Other includes Canada, Fiji, Cook Islands, Belize, Sweden, Tonga, and Ecuador.

Table 3. Fishery statistics for the U.S. North Pacific albacore troll fishery.

FISHING SEASON	NO. TRIPS		CATCH (Metric Tons)		NO. FISH LANDED		AVG FL (cm)	AVG WT (lb)	EFFORT		CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	MEASURED			NO. DAYS	NO. VESSELS		LOG[1]	L-F
1989	839	168	1,860	403	322,238	9,353	66	12.7	11,650	324	28	22%	2.9%
1990	759	218	2,603	1,437	353,361	41,108	71	16.2	9,486	450	37	55%	11.6%
1991	517	114	1,845	1,146	325,927	22,857	65	12.5	9,419	200	35	62%	7.0%
1992	1,440	299	4,572	2,008	864,041	40,115	64	11.7	17,013	600	51	44%	4.6%
1993	1,887	189	6,254	1,306	910,470	10,885	69	15.1	23,988	650	38	21%	1.2%
1994	2,348	413	10,978	4,698	1,455,364	18,433	72	16.6	23,367	725	62	43%	1.3%
1995	950	366	8,200	5,028	1,207,864	24,350	69	15.0	25,732	484	47	61%	2.0%
1996	1,750	427	16,346	7,000	2,831,568	49,378	66	12.7	30,933	733	92	43%	1.7%
1997	3,600	514	14,151	5,403	2,035,001	40,883	70	15.3	44,356	1,182	46	38%	2.0%
1998	2,550	285	14,025	5,321	2,153,012	16,505	68	14.4	19,053	892	113	38%	0.8%
1999	2,660	345	11,169	3,464	1,401,624	15,278	73	17.6	35,249	775	40	31%	1.1%

Table 4. Fishery statistics for the U.S. South Pacific albacore troll fishery.

FISHING SEASON	NO. TRIPS		CATCH (Metric Tons)		NO. FISH LANDED		AVG FL (cm)	AVG WT (lb)	EFFORT		CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	MEASURED			NO. DAYS	NO. VESSELS		LOG[1]	L-F
1988-89	81	46	3,280	1,899	488,745	17,582	69	14.8	3,990	42	122	58%	3.6%
1989-90	76	67	3,922	3,477	607,381	3,782	68	14.2	3,686	39	165	89%	0.6%
1990-91	73	59	5,540	4,787	745,254	12,238	71	16.4	7,097	54	105	86%	1.6%
1991-92	56	38	3,055	1,955	465,017	5,009	68	14.5	6,553	54	71	64%	1.1%
1992-93	43	8	1,036	914	199,520	1,720	63	11.4	4,433	44	45	19%	0.9%
1993-94	12	7	530	251	89,653	996	66	13.0	1,043	13	86	47%	1.1%
1994-95	42	22	2,092	1,153	298,291	1,460	70	15.5	1,993	21	150	55%	0.5%
1995-96	48	30	2,186	1,124	316,122	2,226	70	15.2	4,378	53	72	51%	0.7%
1996-97	25	21	1,403	1,038	227,416	1,558	67	13.6	2,910	27	78	74%	0.7%
1997-98	39	34	1,764	1,197	287,254	200	67	13.5	5,379	37	53	68%	0.1%
1998-99	24	13	1,200	629	167,839	790	70	15.8	2,166	20	77	52%	0.5%

[1] Includes some non-U.S. vessels (Tonga, Canada, and Cook Islands) and vessels of unknown registry for logbook sampling coverage rate.

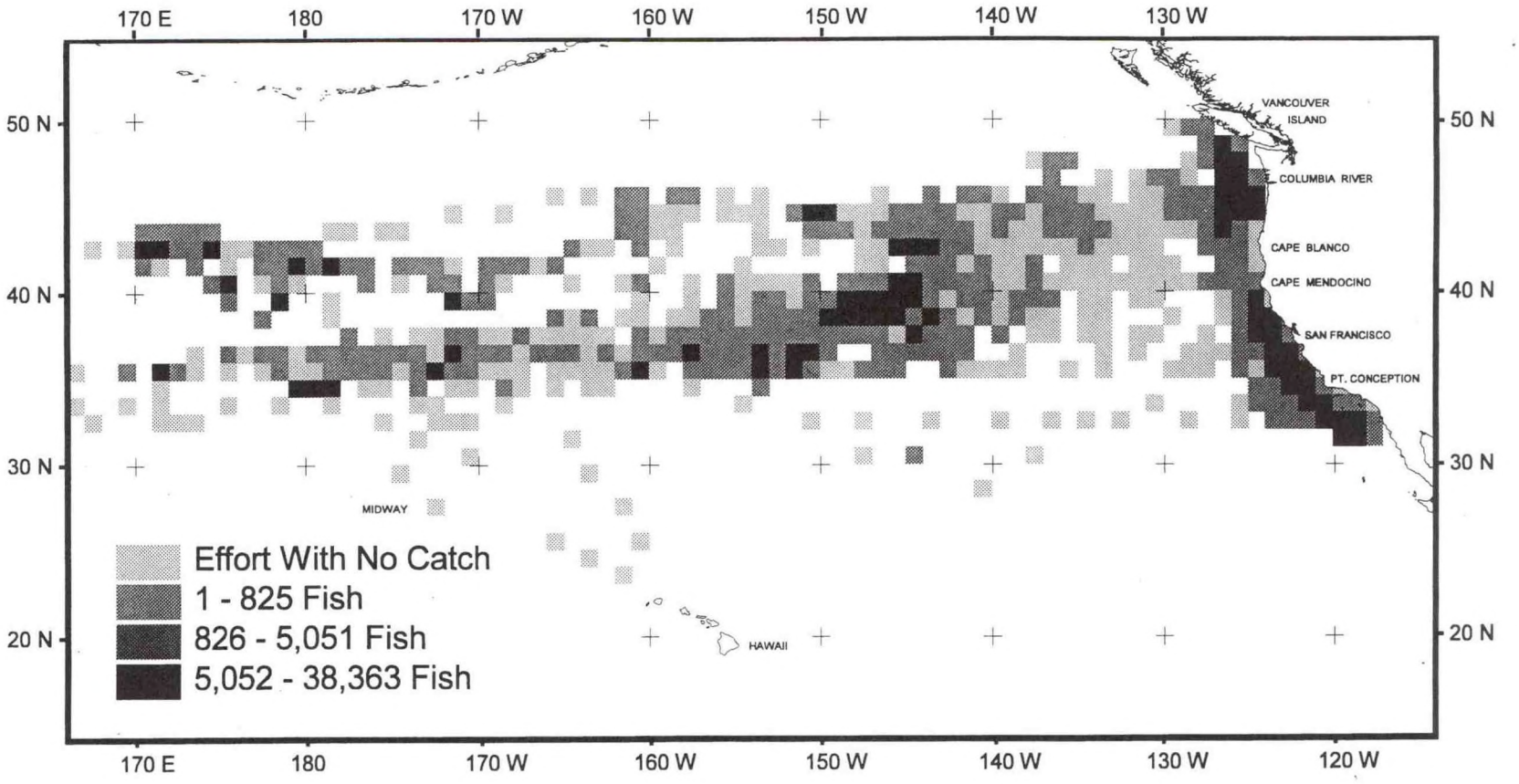

Figure 1. Distribution of albacore catches by U.S. troll vessels in the 1999 North Pacific season.

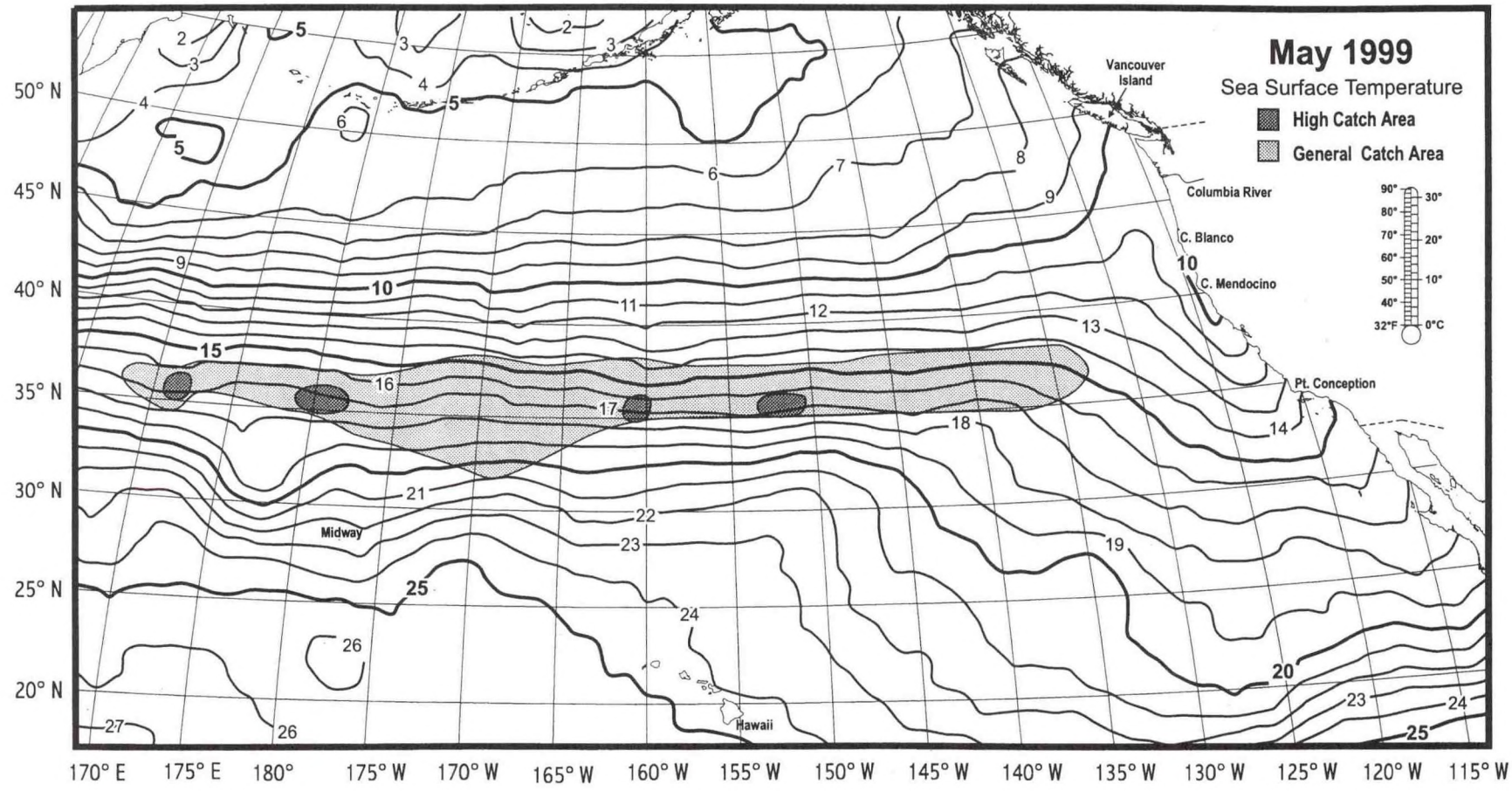

Figure 2a. Distribution of albacore catches and Sea Surface Temperatures in May 1999.

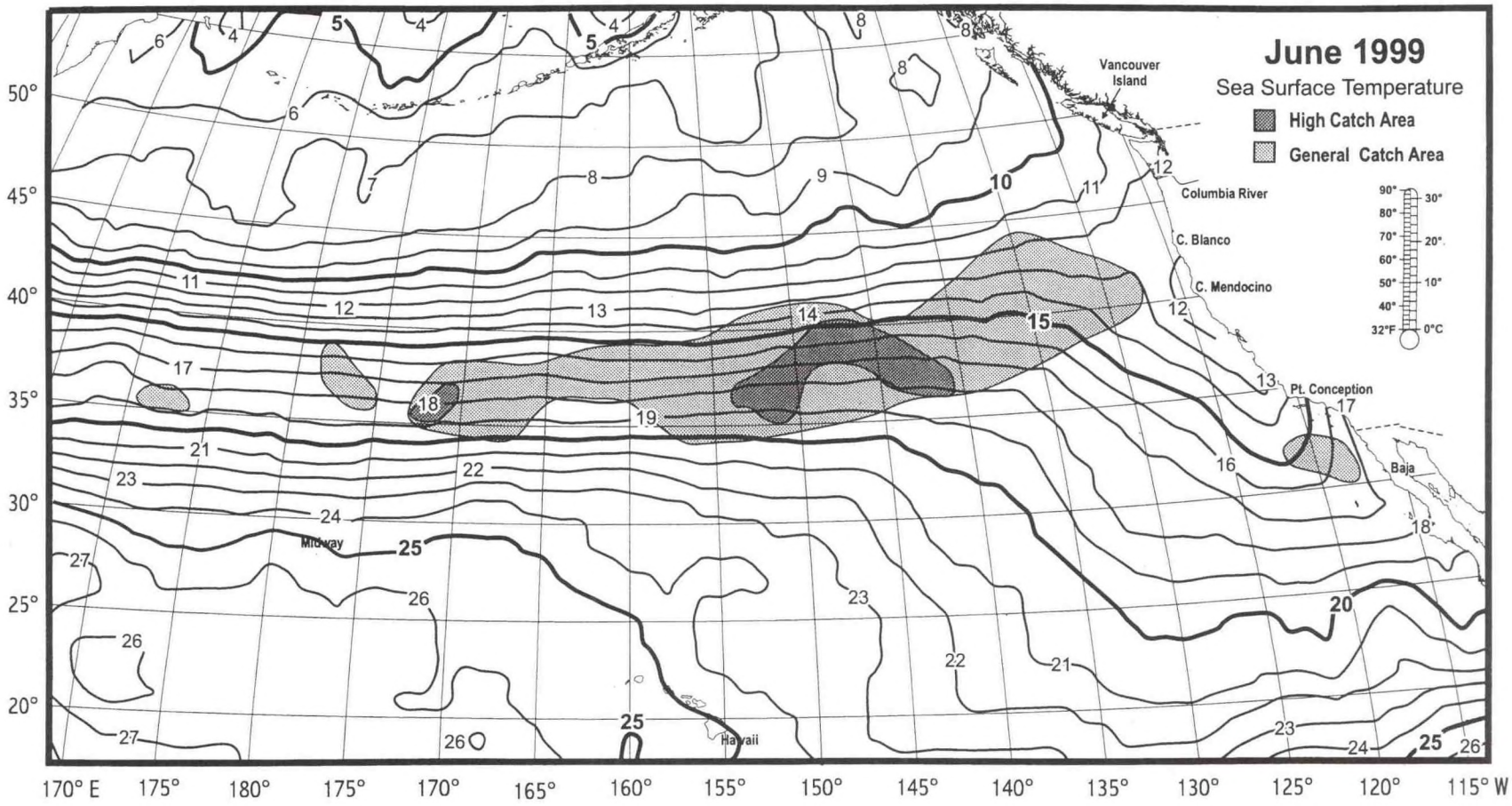

Figure 2b. Distribution of albacore catches and Sea Surface Temperatures in June 1999.

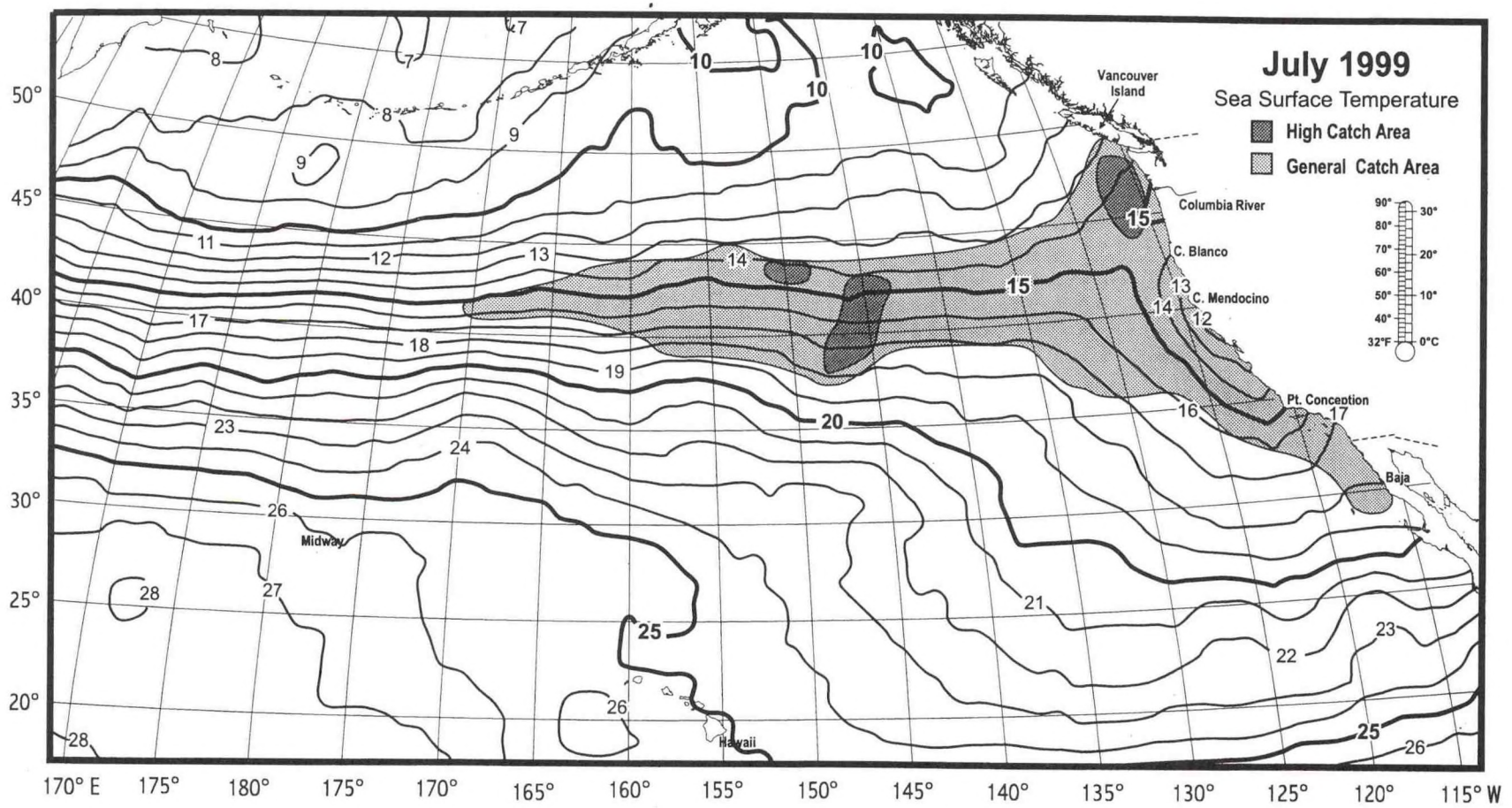

Figure 2c. Distribution of albacore catches and Sea Surface Temperatures in July 1999.

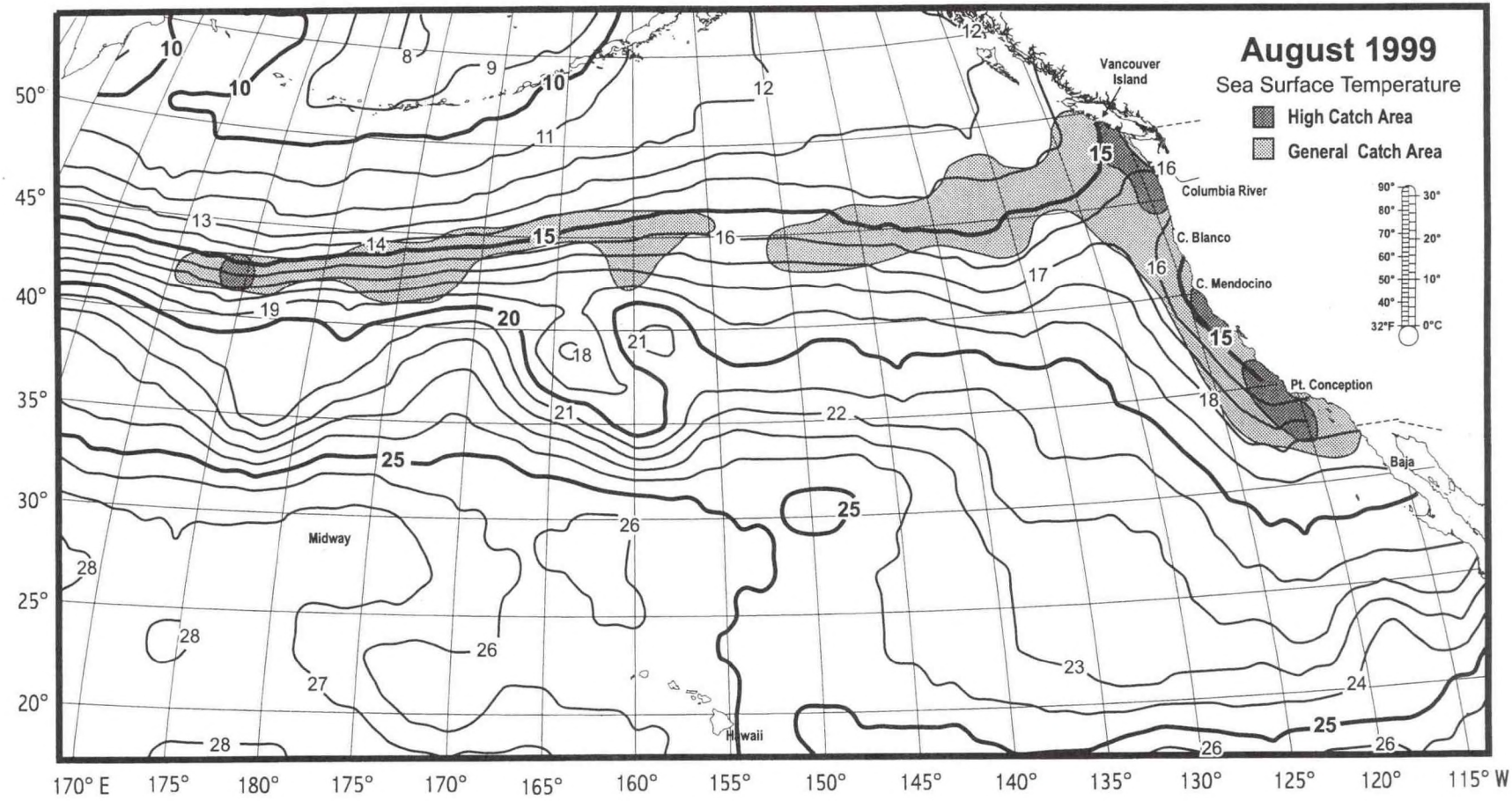

Figure 2d. Distribution of albacore catches and Sea Surface Temperatures in August 1999.

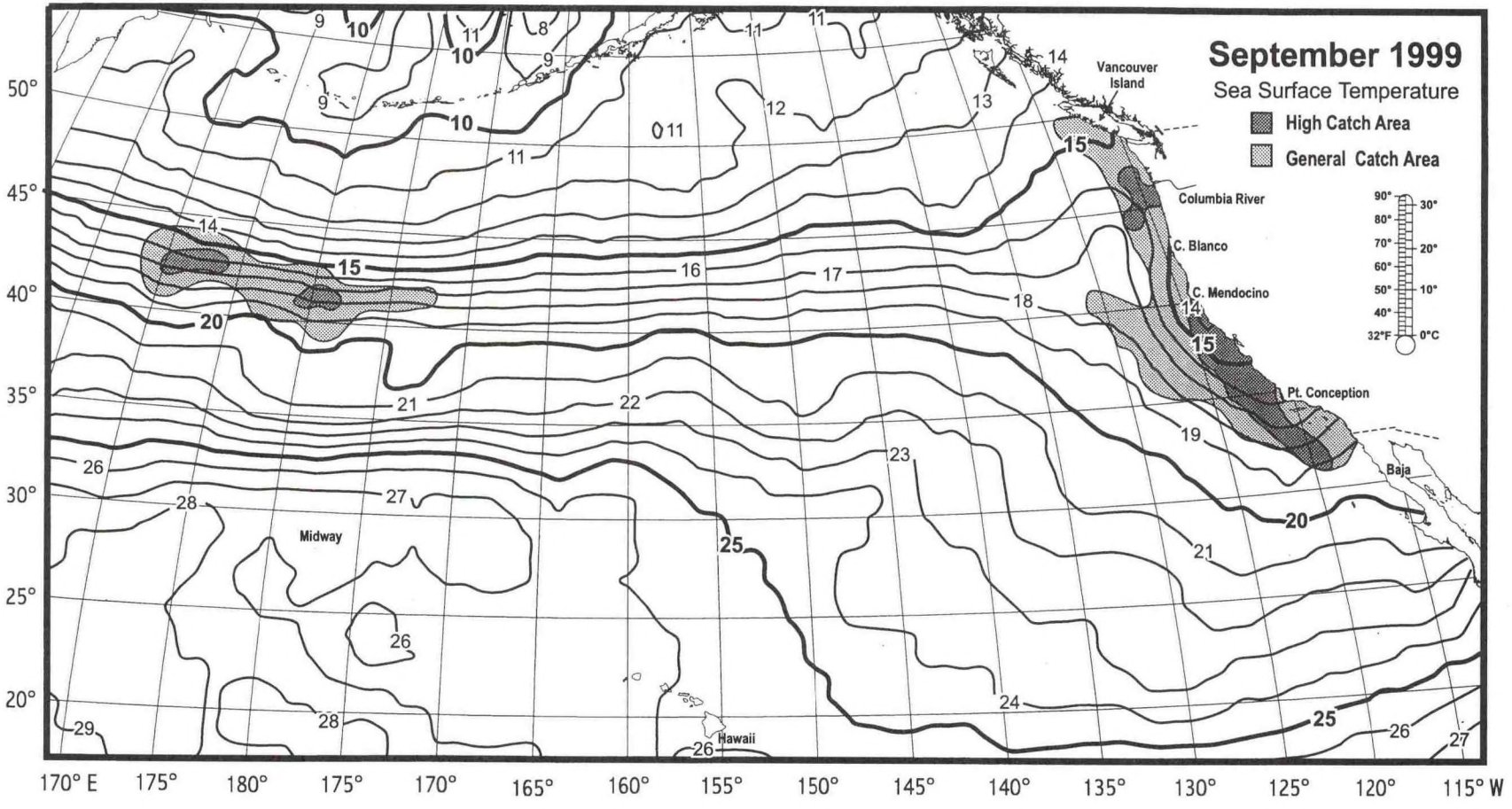

Figure 2e. Distribution of albacore catches and Sea Surface Temperatures in September 1999.

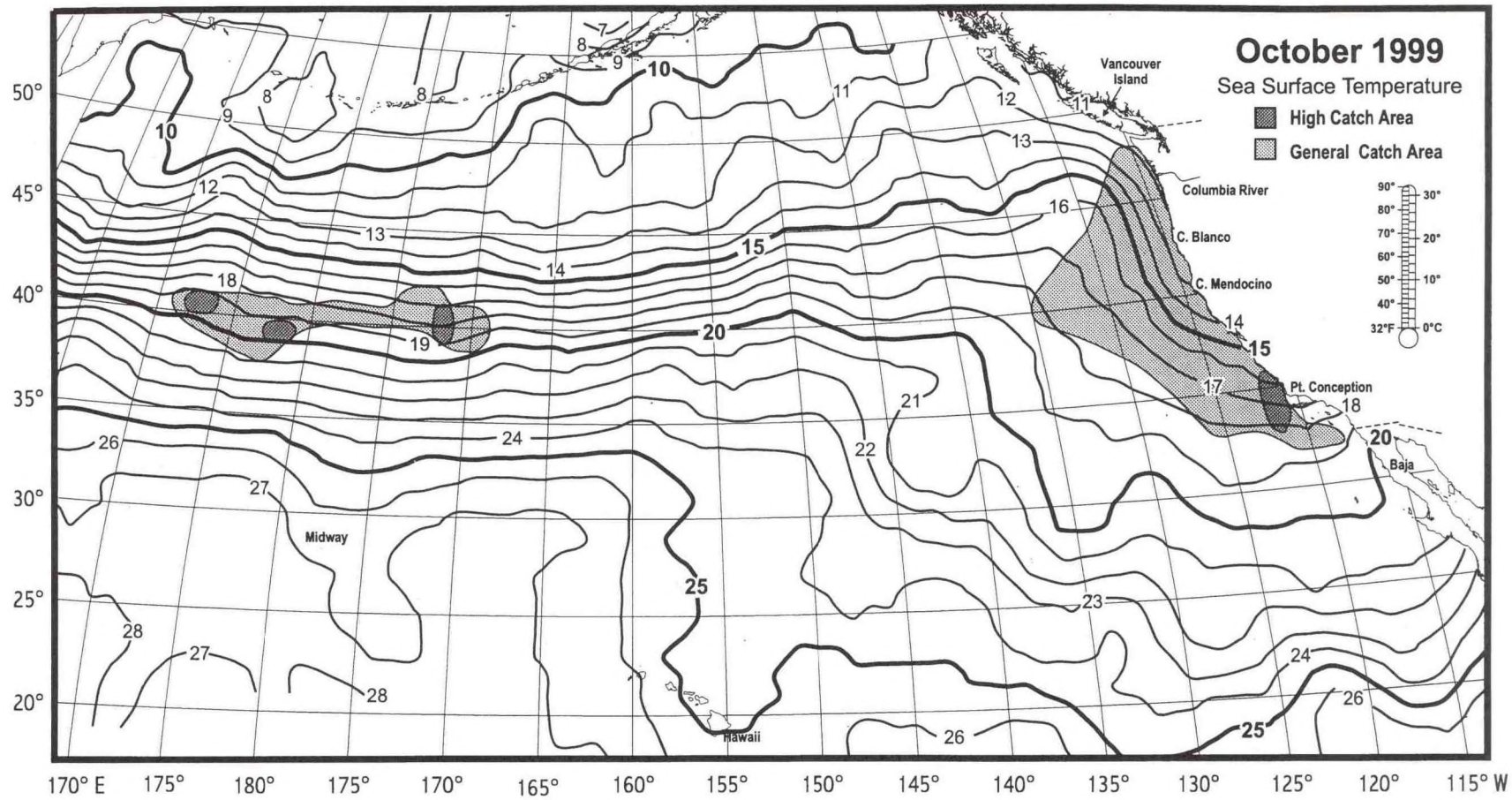

Figure 2f. Distribution of albacore catches and Sea Surface Temperatures in October 1999.

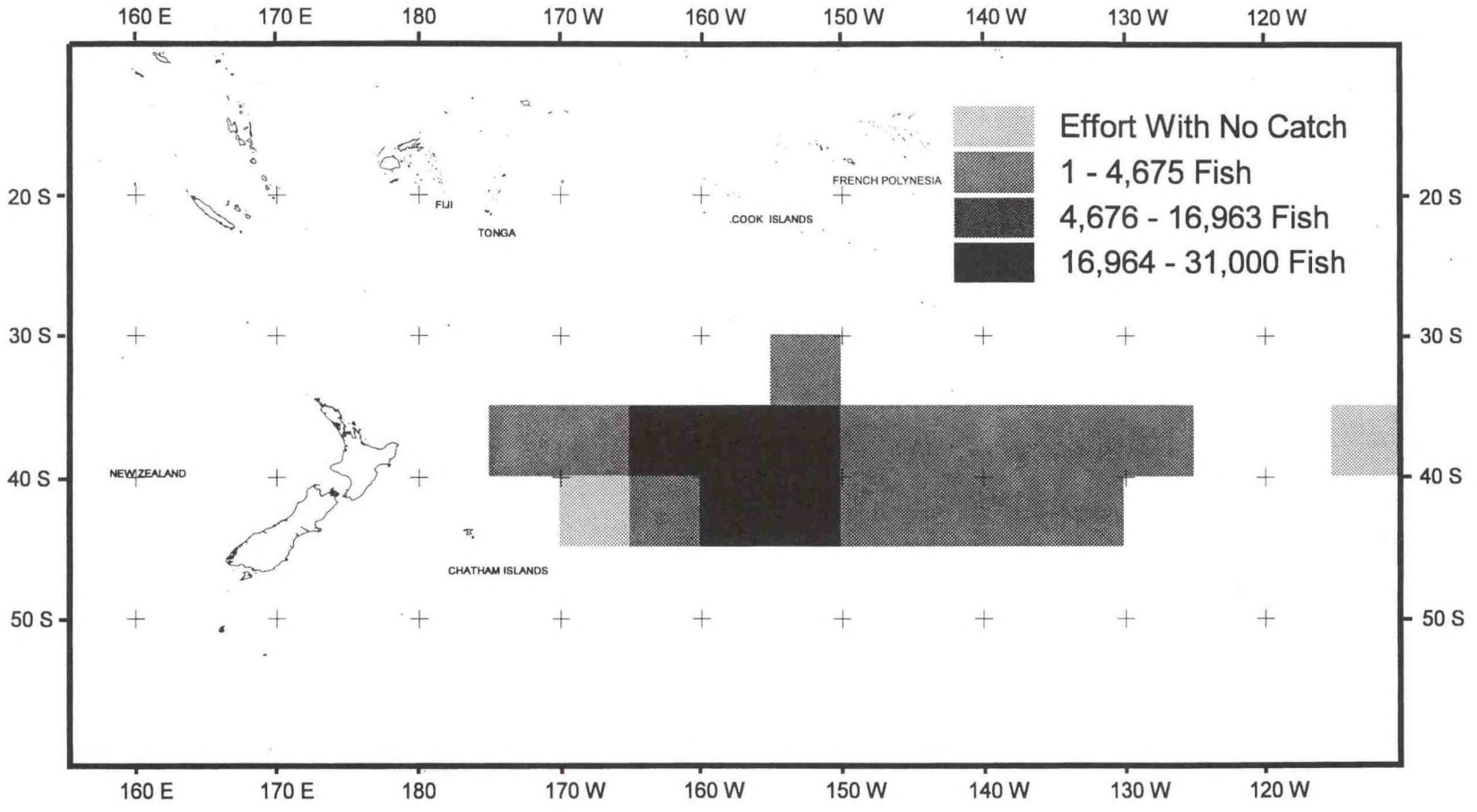

Figure 3a. Distribution of albacore catches by U.S. troll vessels in the 1998-99 South Pacific season.

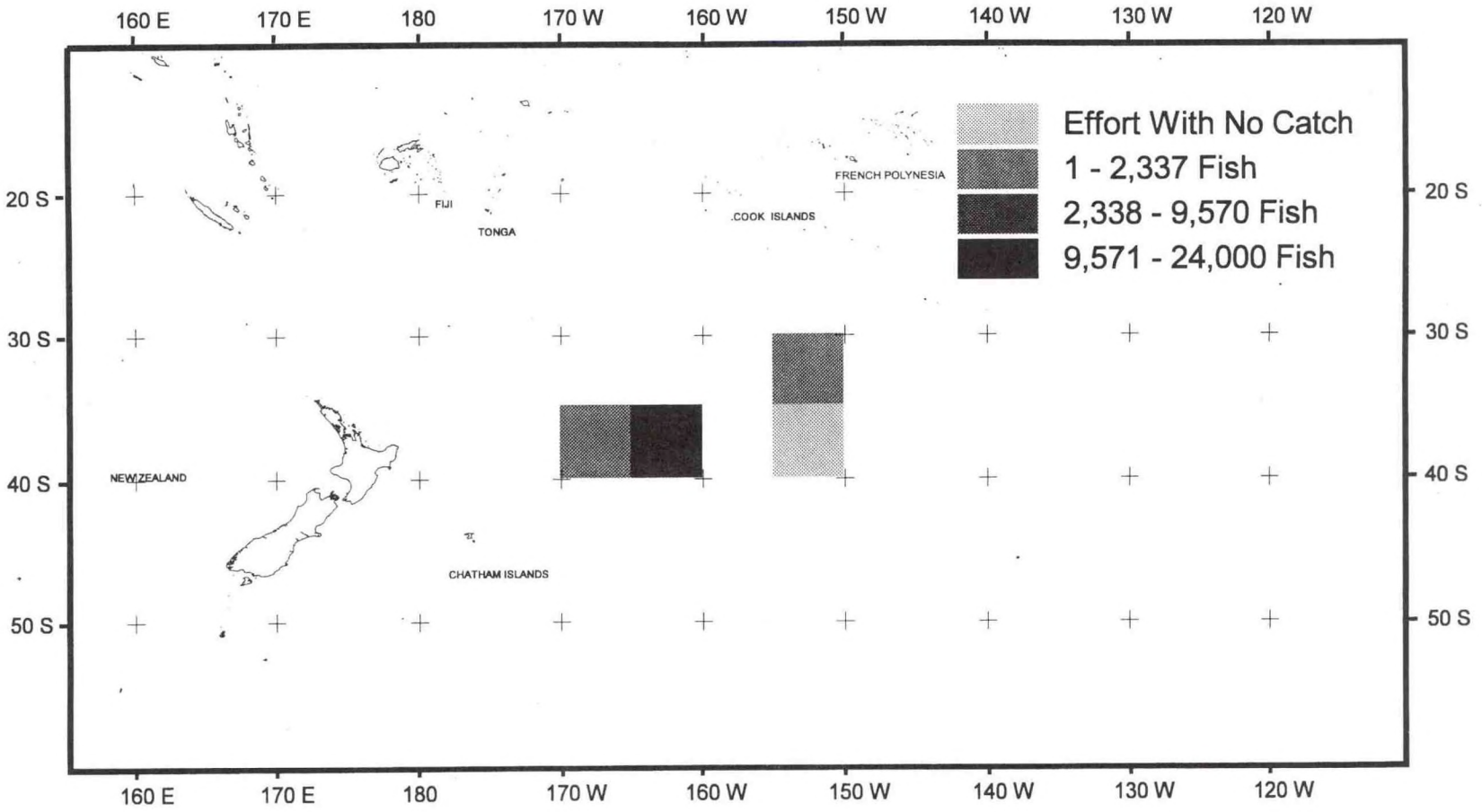

Figure 3b. Distribution of albacore catches by U.S. troll vessels in December 1998.

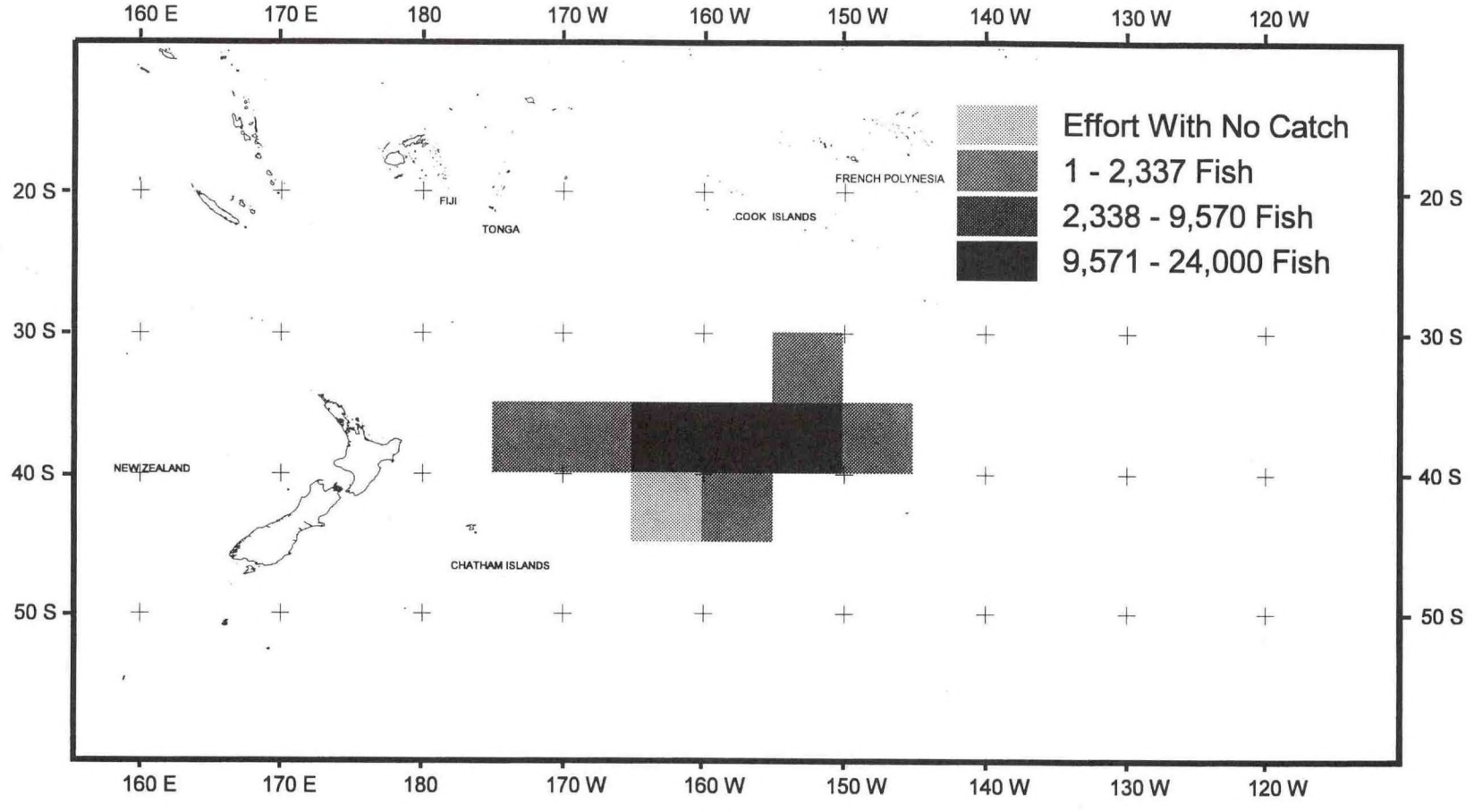

Figure 3c. Distribution of albacore catches by U.S. troll vessels in January 1999.

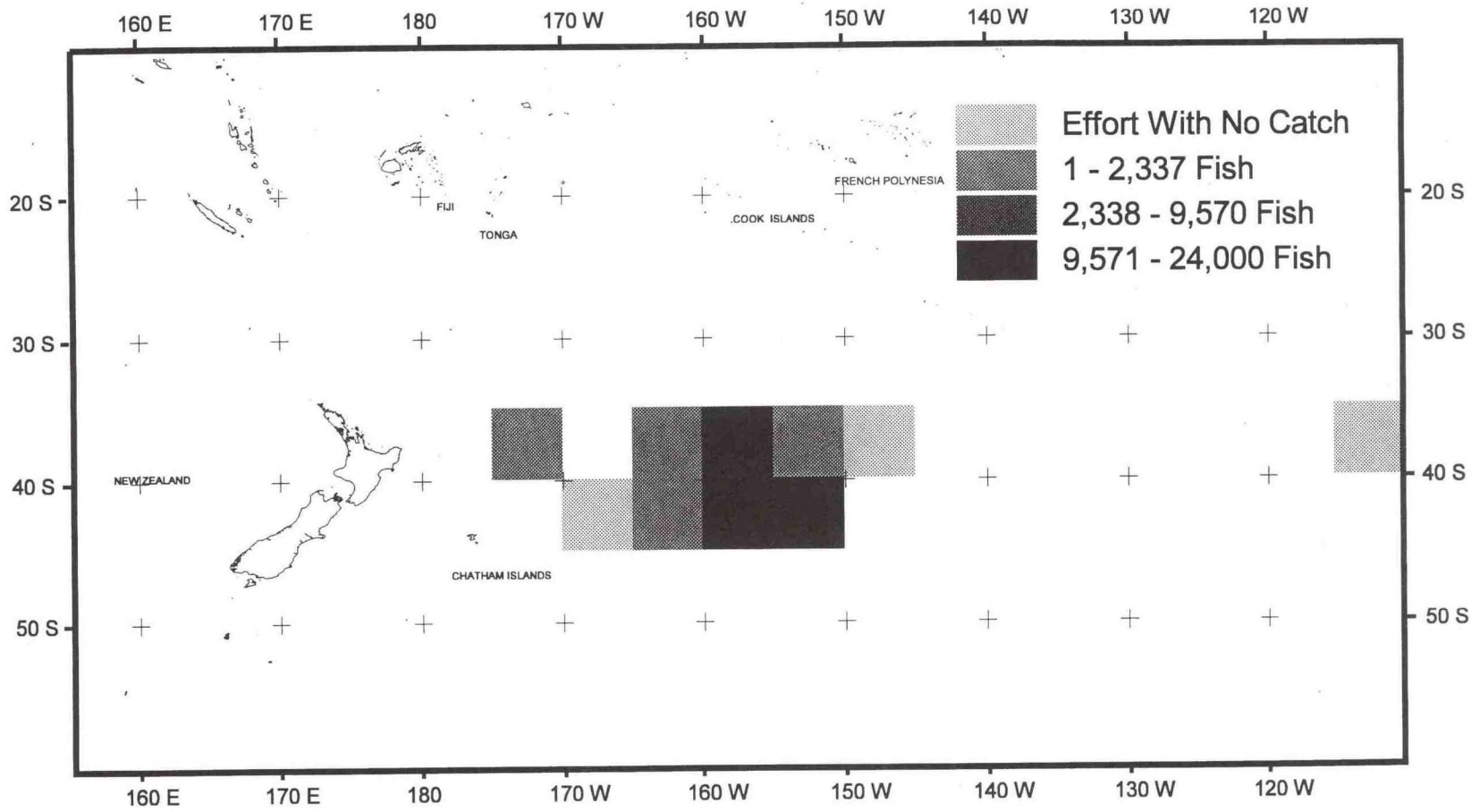

Figure 3d. Distribution of albacore catches by U.S. troll vessels in February 1999.

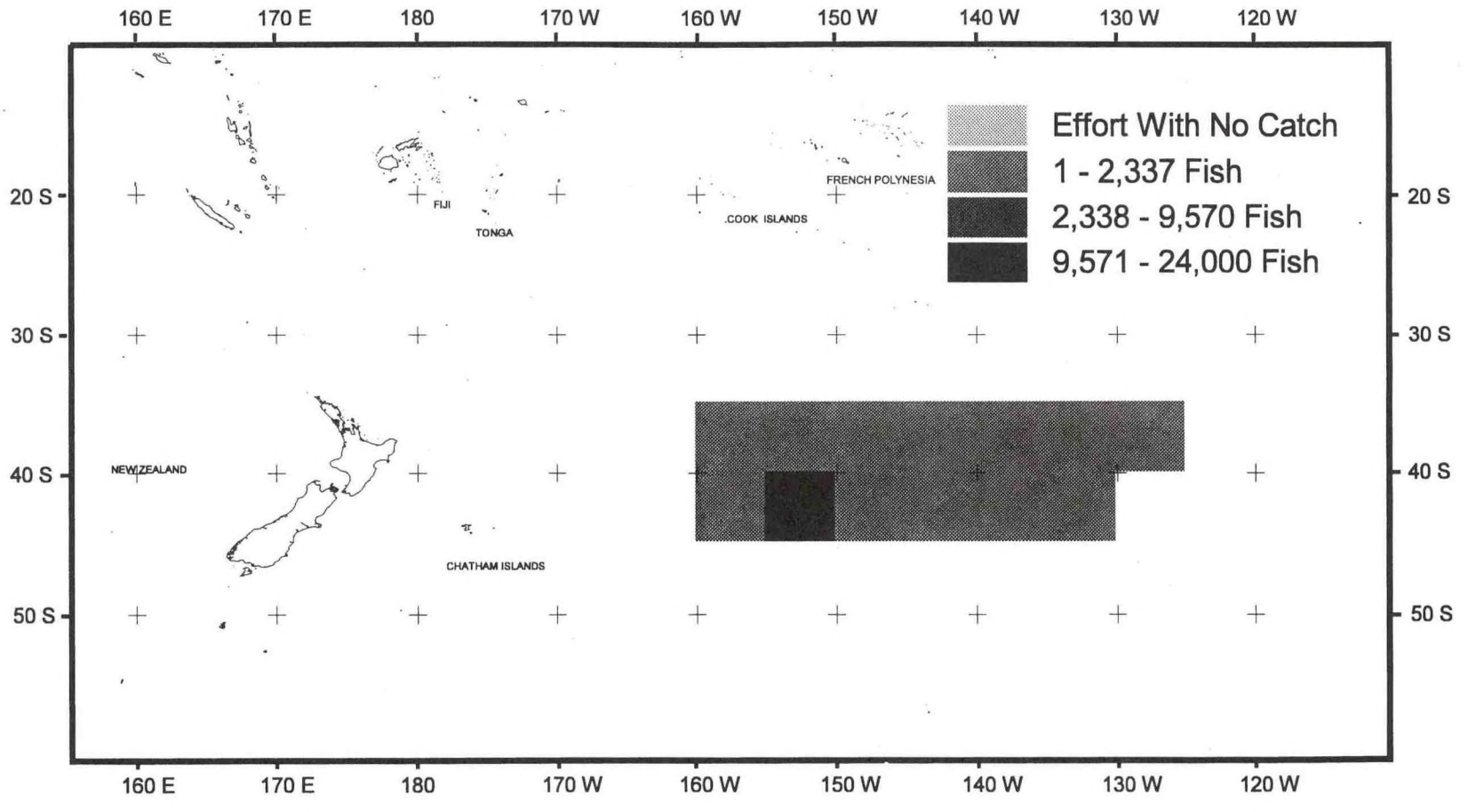

Figure 3e. Distribution of albacore catches by U.S. troll vessels in March 1999.

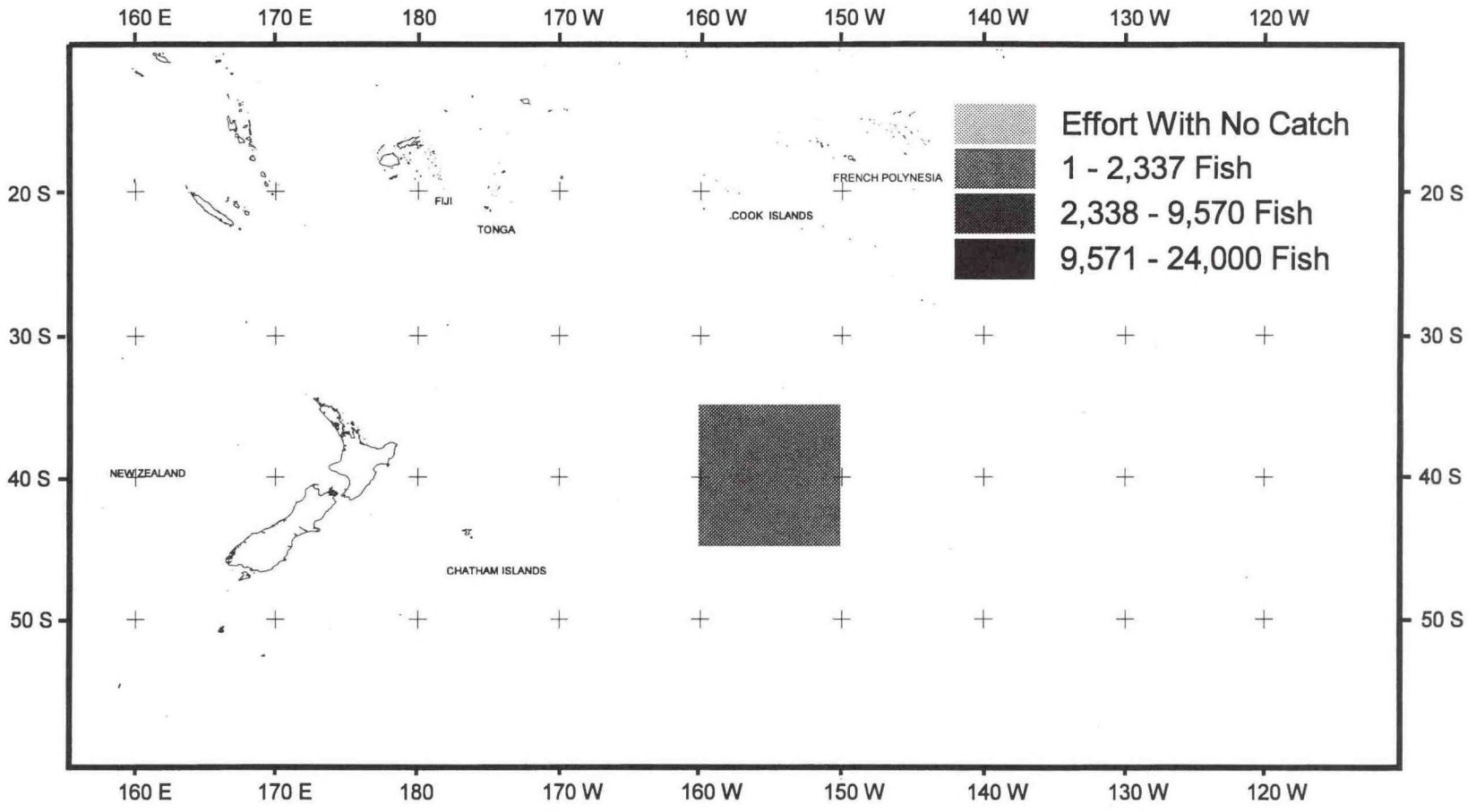

Figure 3f. Distribution of albacore catches by U.S. troll vessels in April 1999.

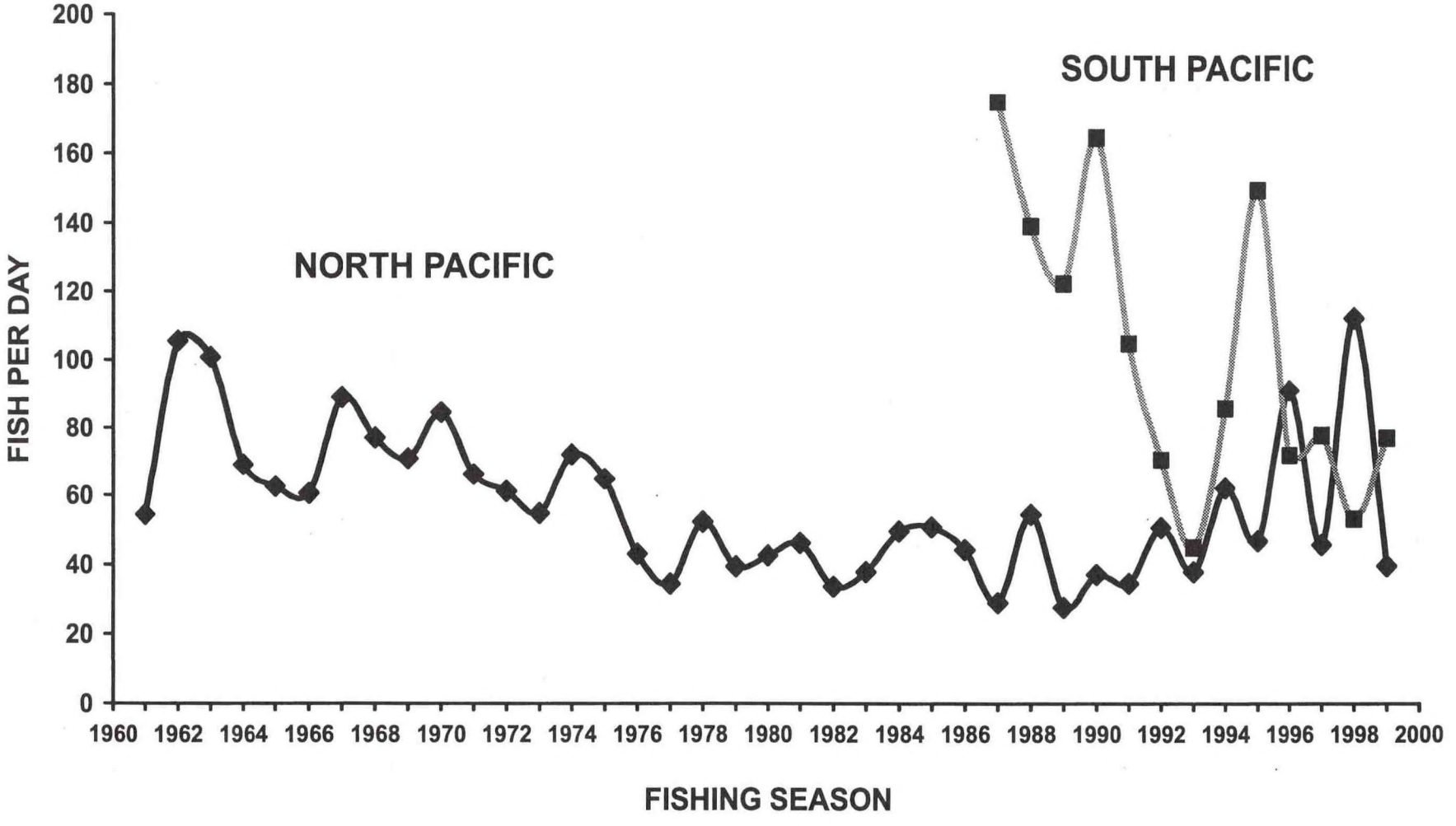

Figure 4. North and South Pacific albacore CPUE by U.S. troll vessels from 1961 through 1999.

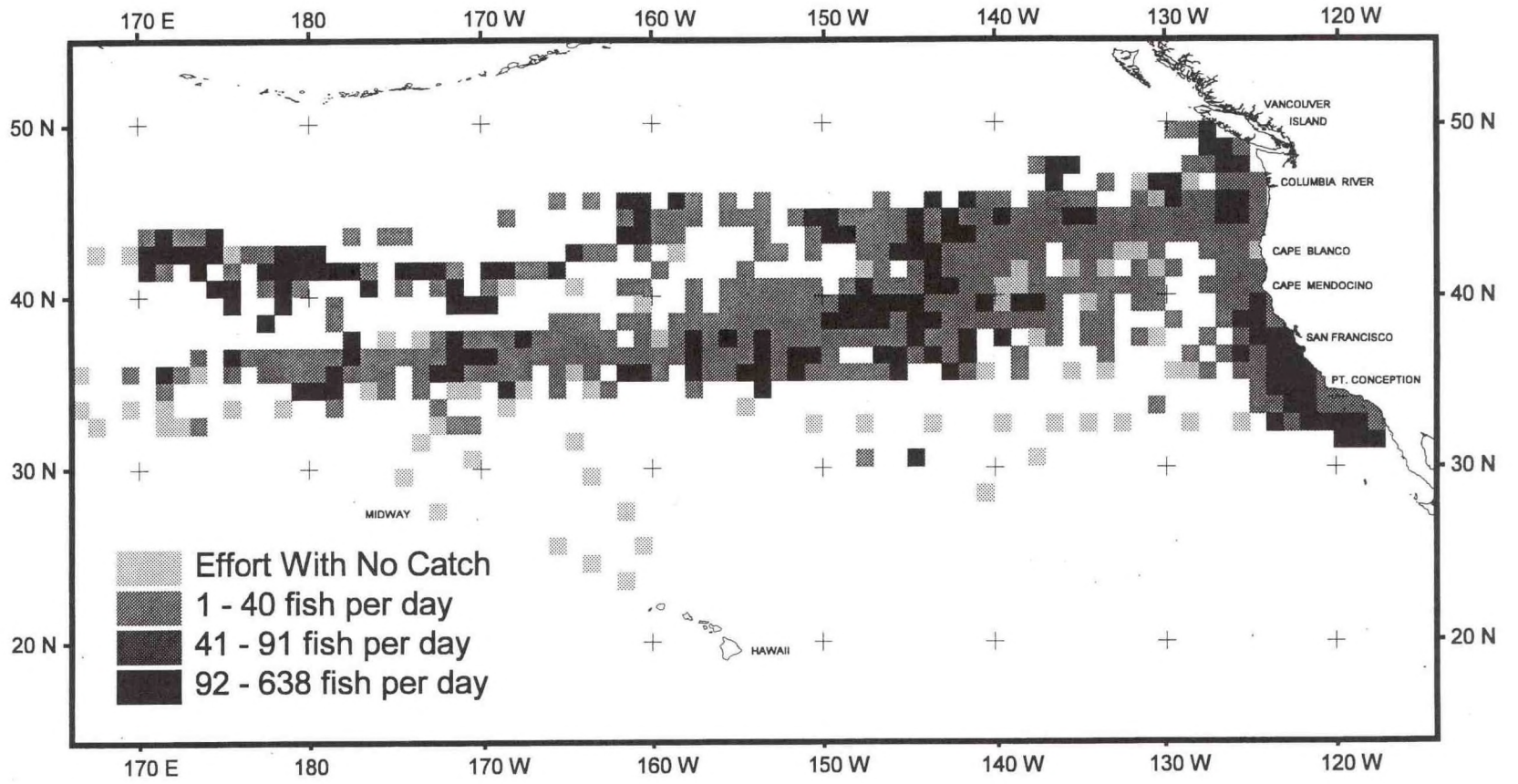

Figure 5a. Distribution of albacore CPUE by U.S. troll vessels in the 1999 North Pacific season.

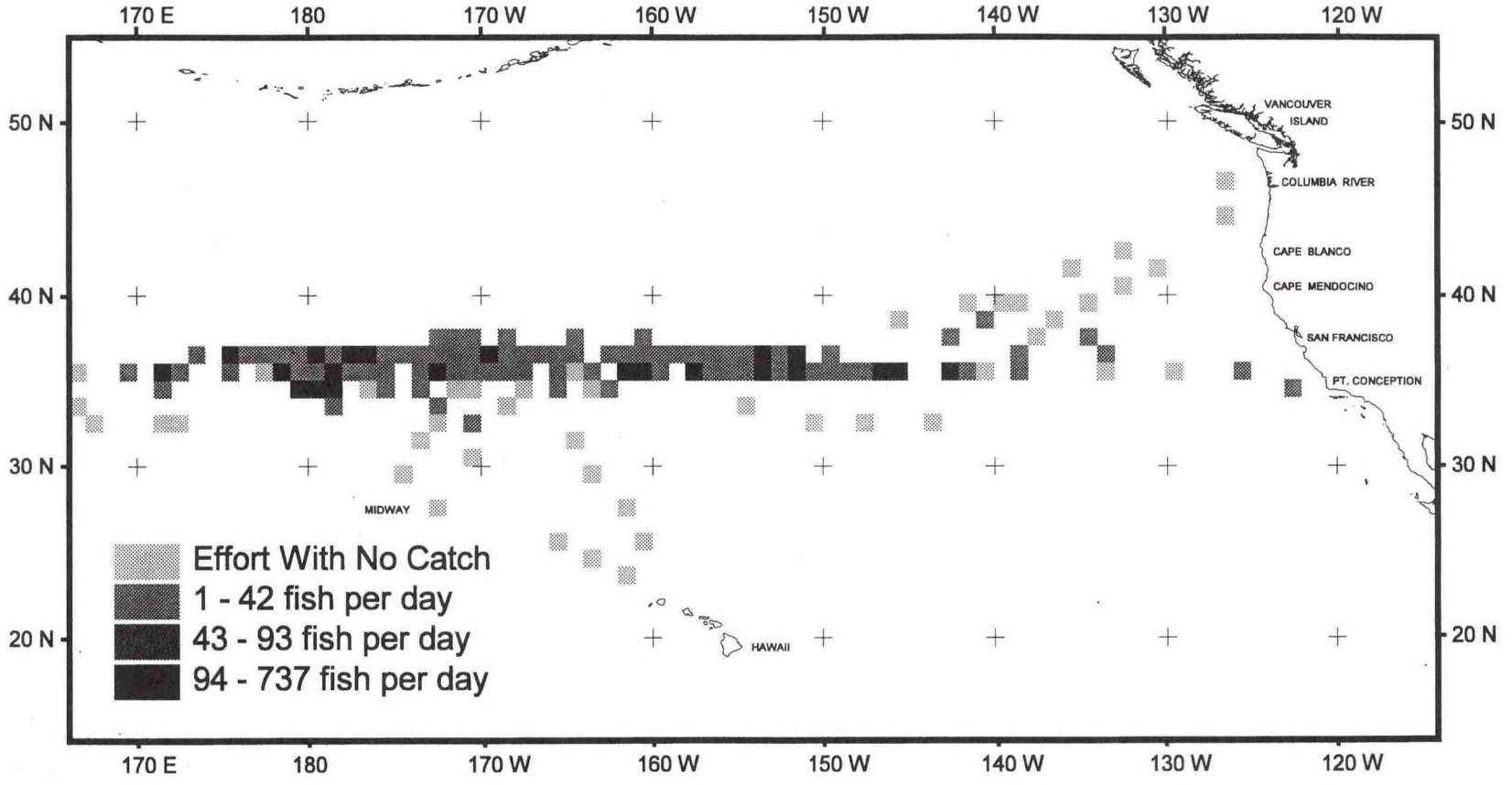

Figure 5b. Distribution of albacore CPUE by U.S. troll vessels in May 1999.

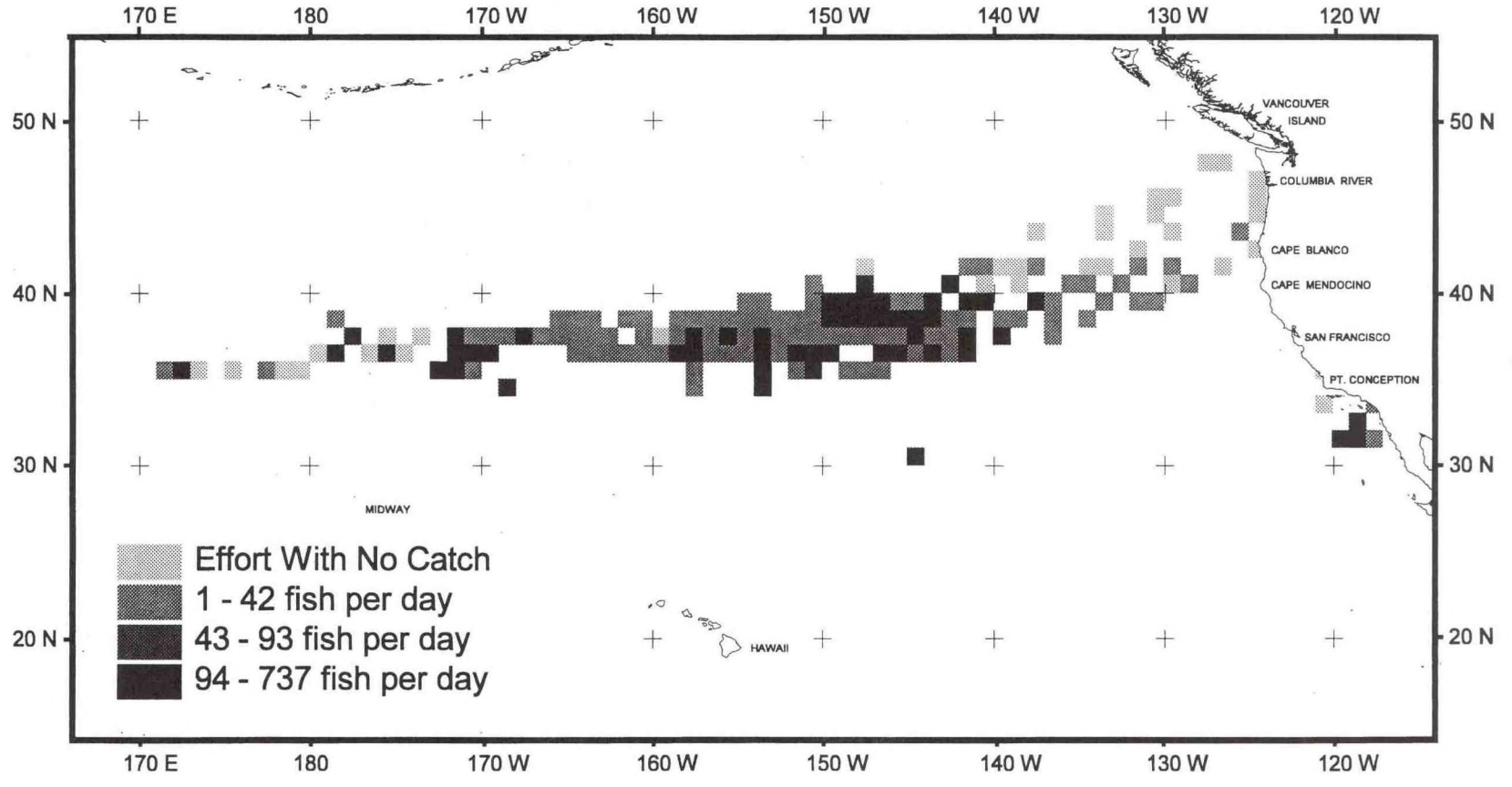

Figure 5c. Distribution of albacore CPUE by U.S. troll vessels in June 1999.

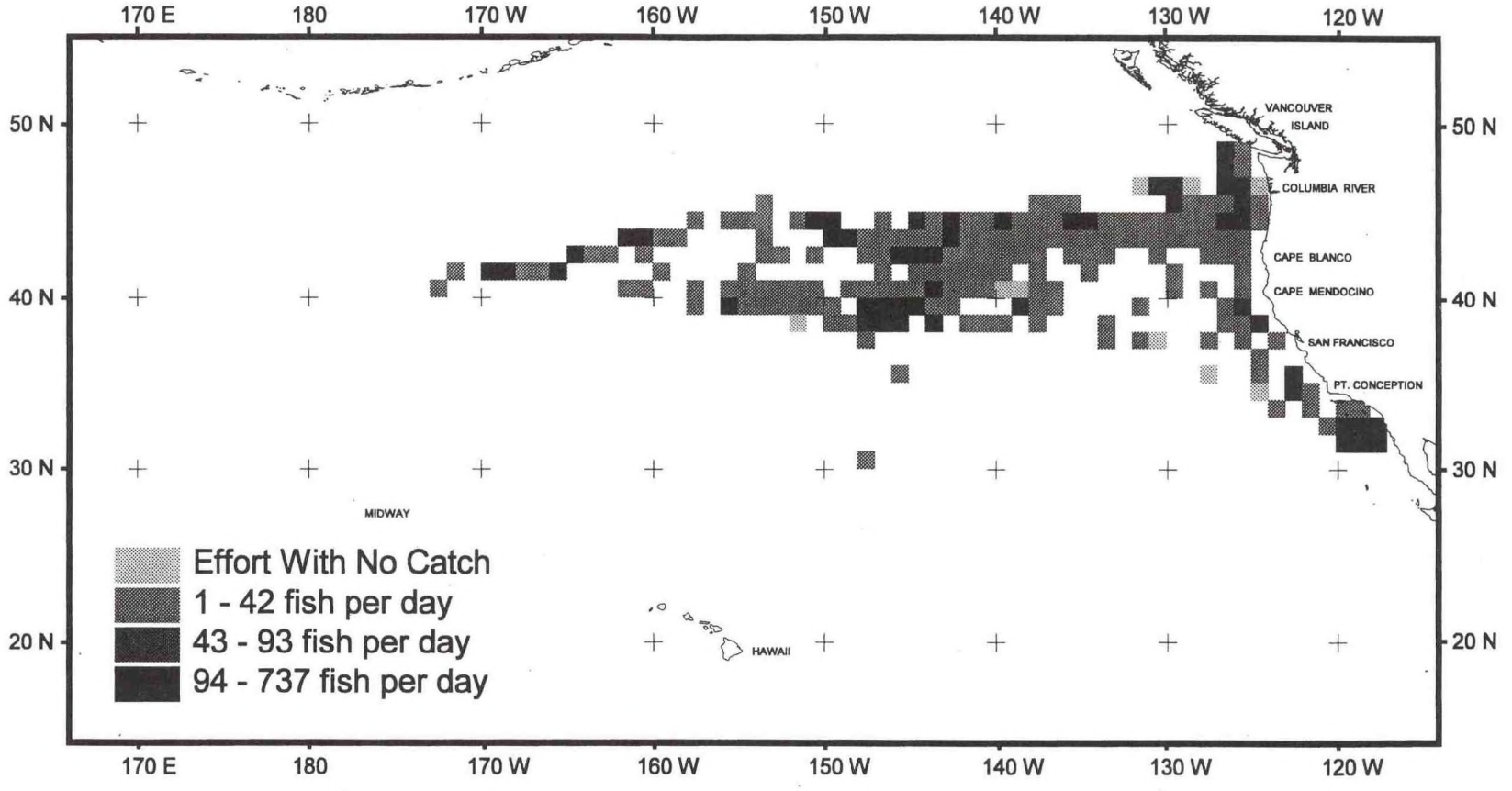

Figure 5d. Distribution of albacore CPUE by U.S. troll vessels in July 1999.

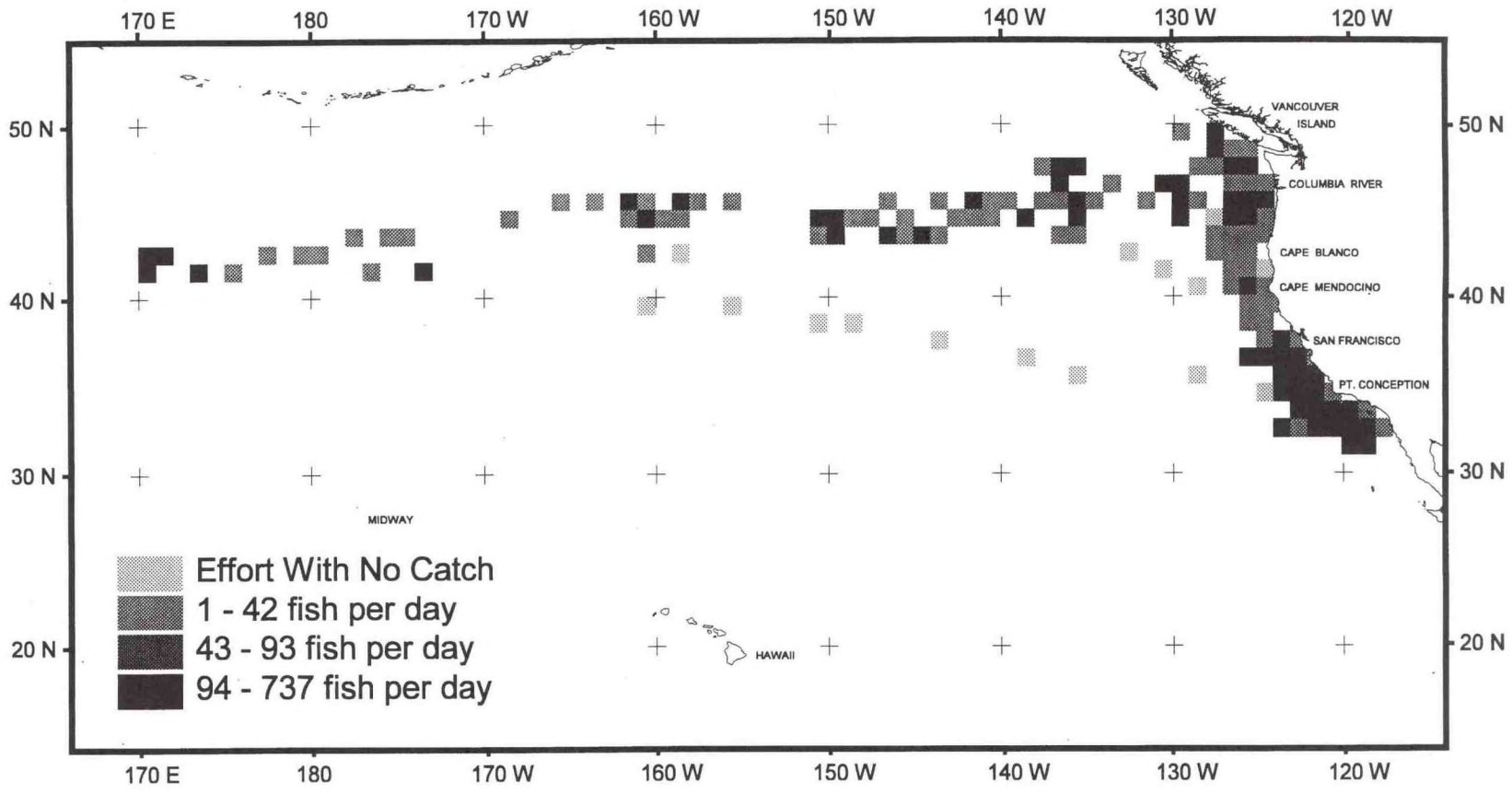

Figure 5e. Distribution of albacore CPUE by U.S. troll vessels in August 1999.

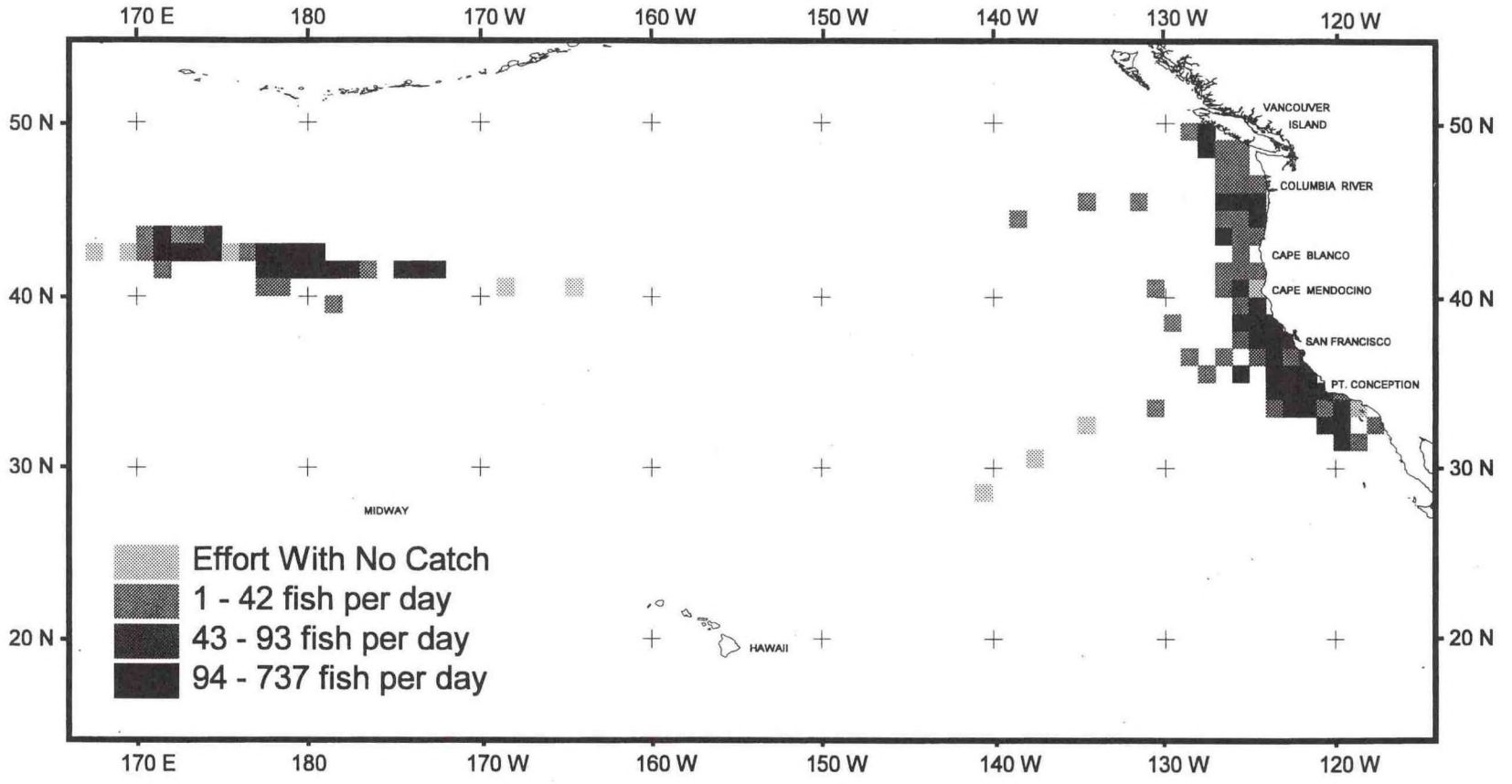

Figure 5f. Distribution of albacore CPUE by U.S. troll vessels in September 1999.

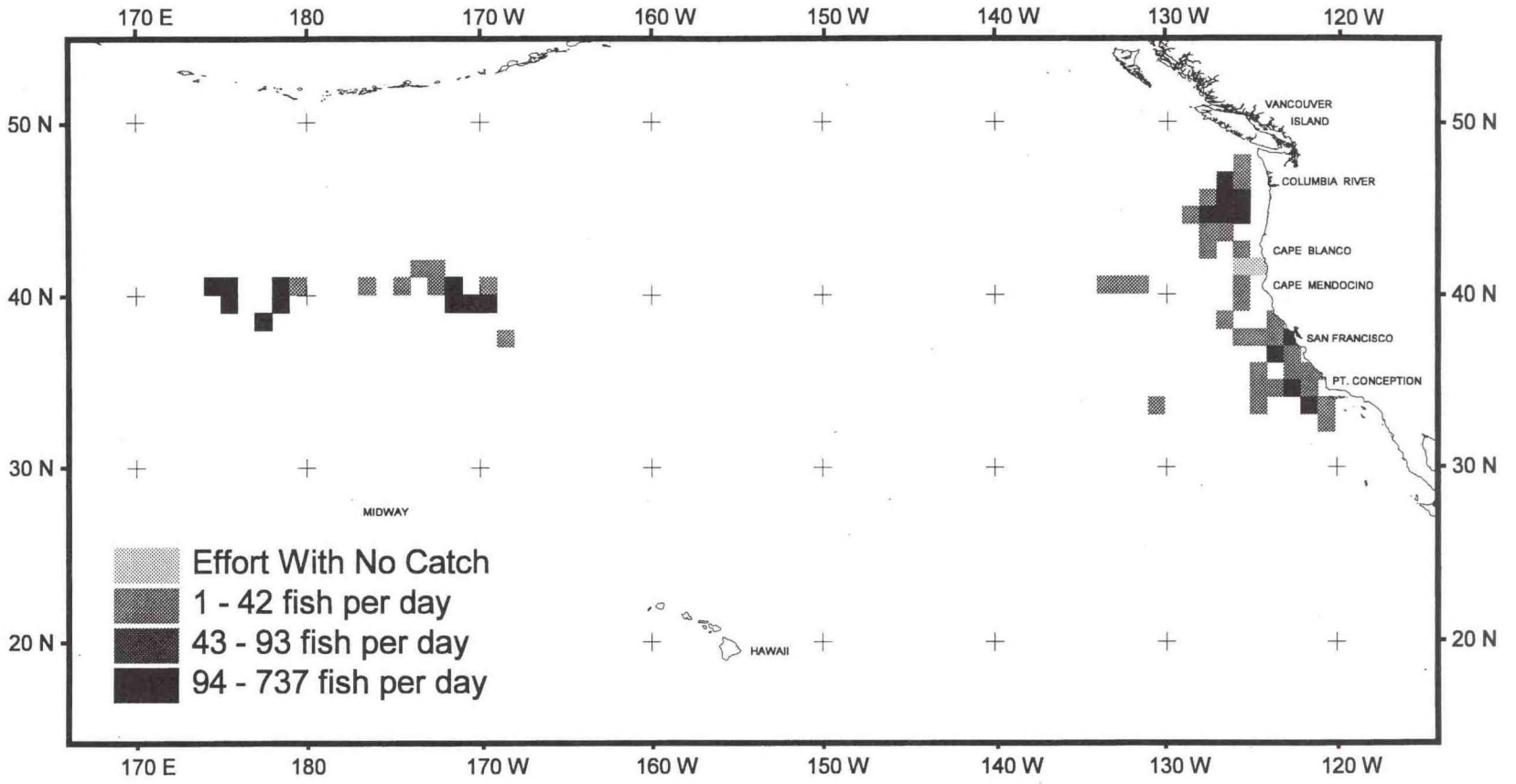

Figure 5g. Distribution of albacore CPUE by U.S. troll vessels in October 1999.

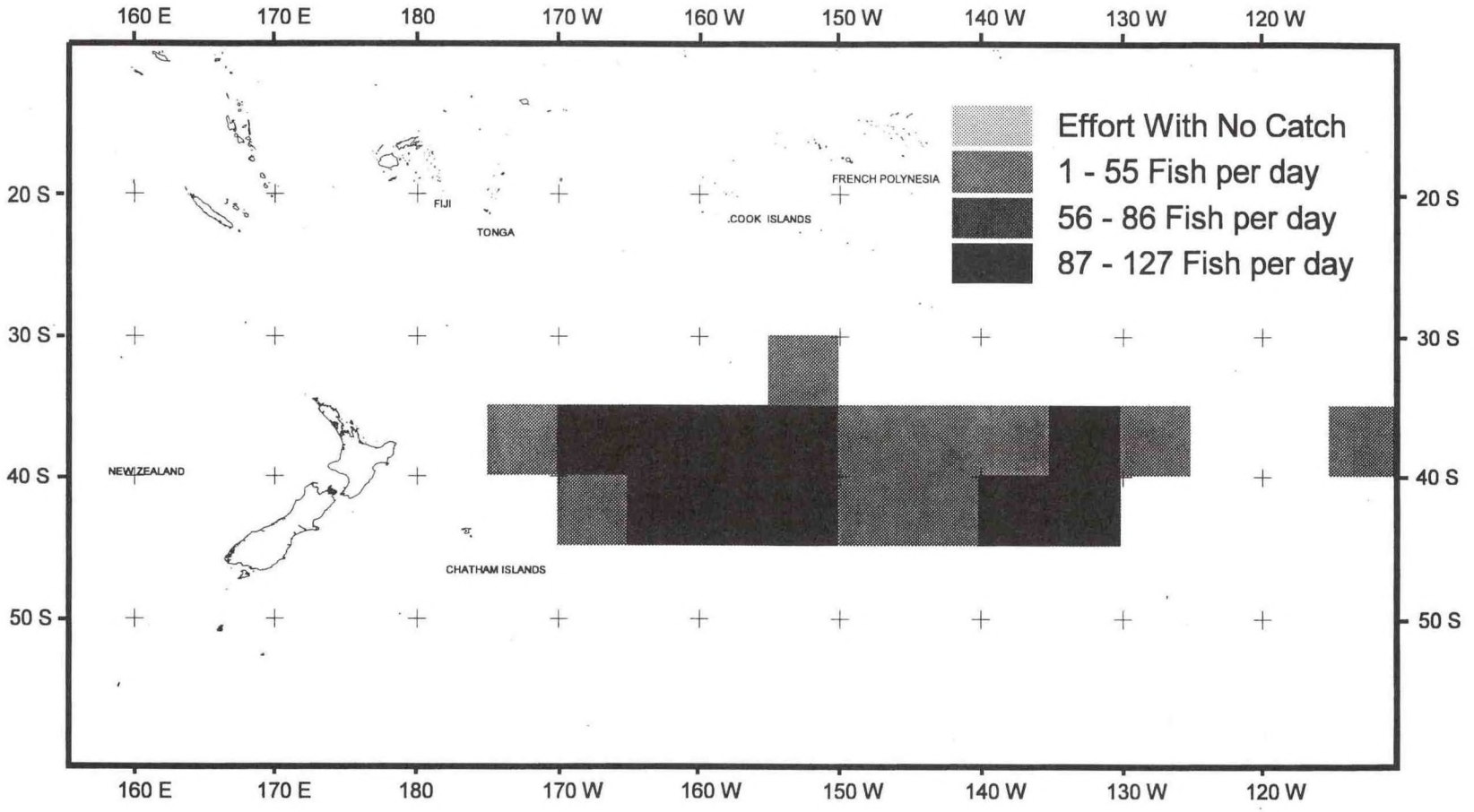

Figure 6a. Distribution of albacore CPUE by U.S. troll vessels in the 1998-99 South Pacific season.

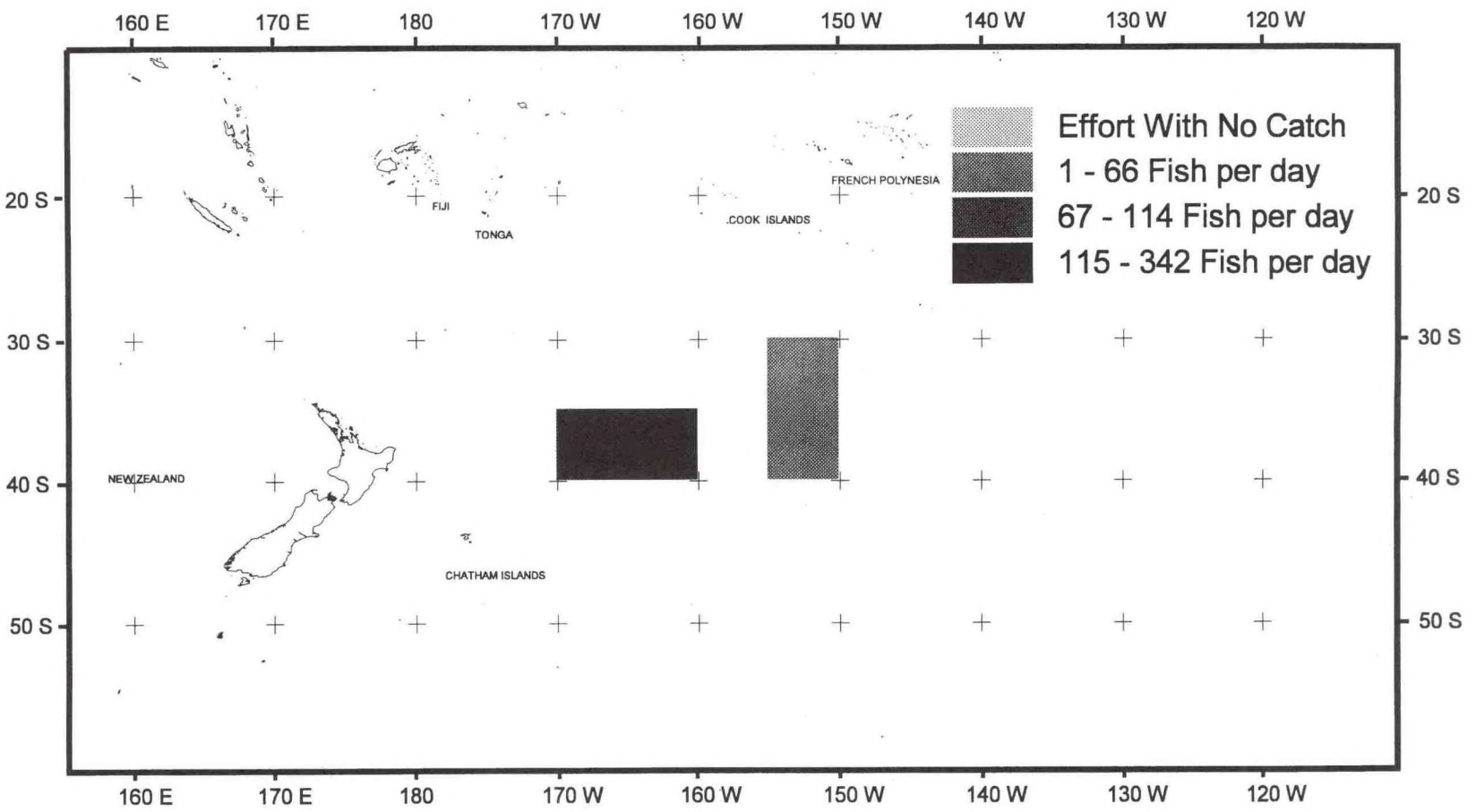

Figure 6b. Distribution of albacore CPUE by U.S. troll vessels in December 1998.

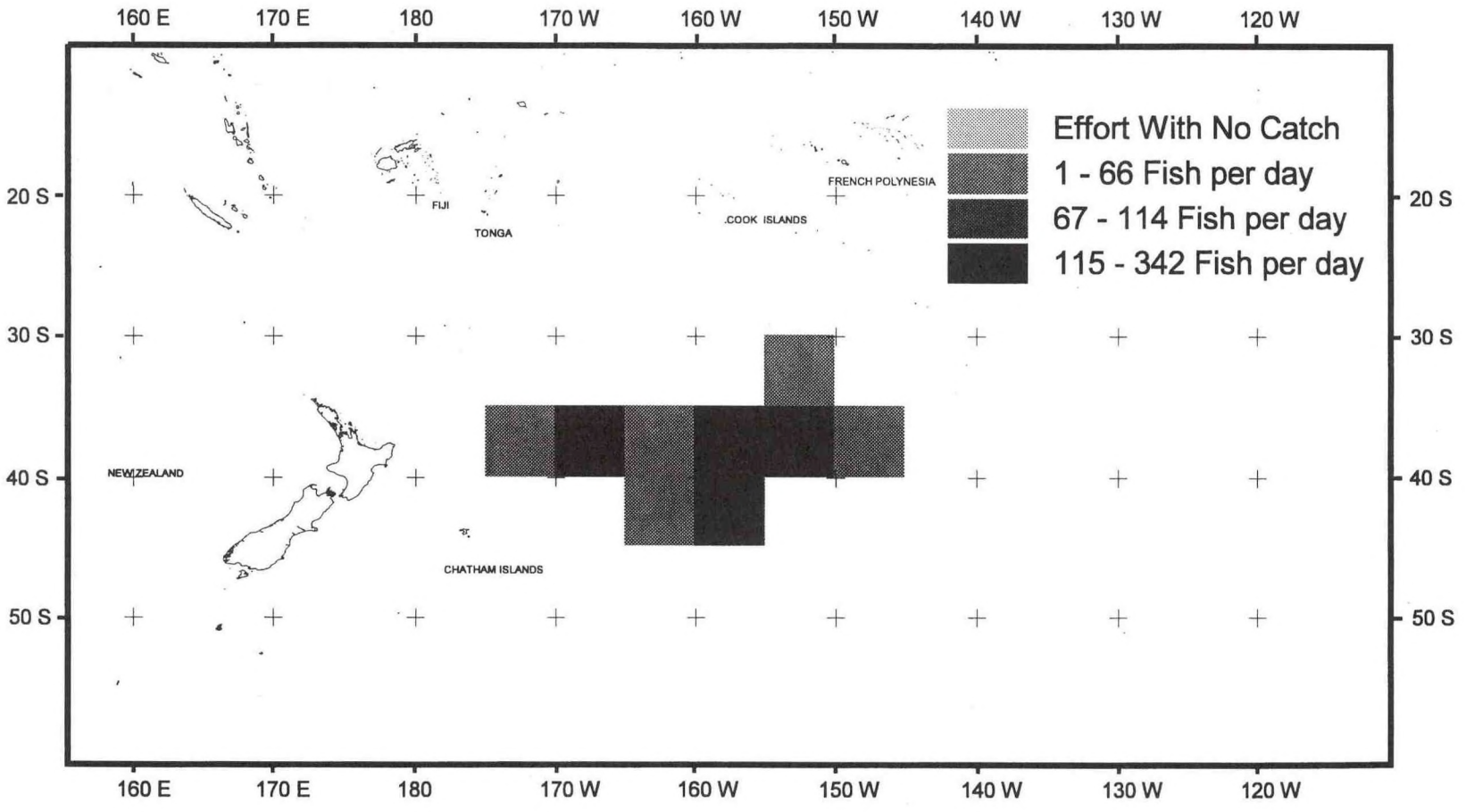

Figure 6c. Distribution of albacore CPUE by U.S. troll vessels in January 1999.

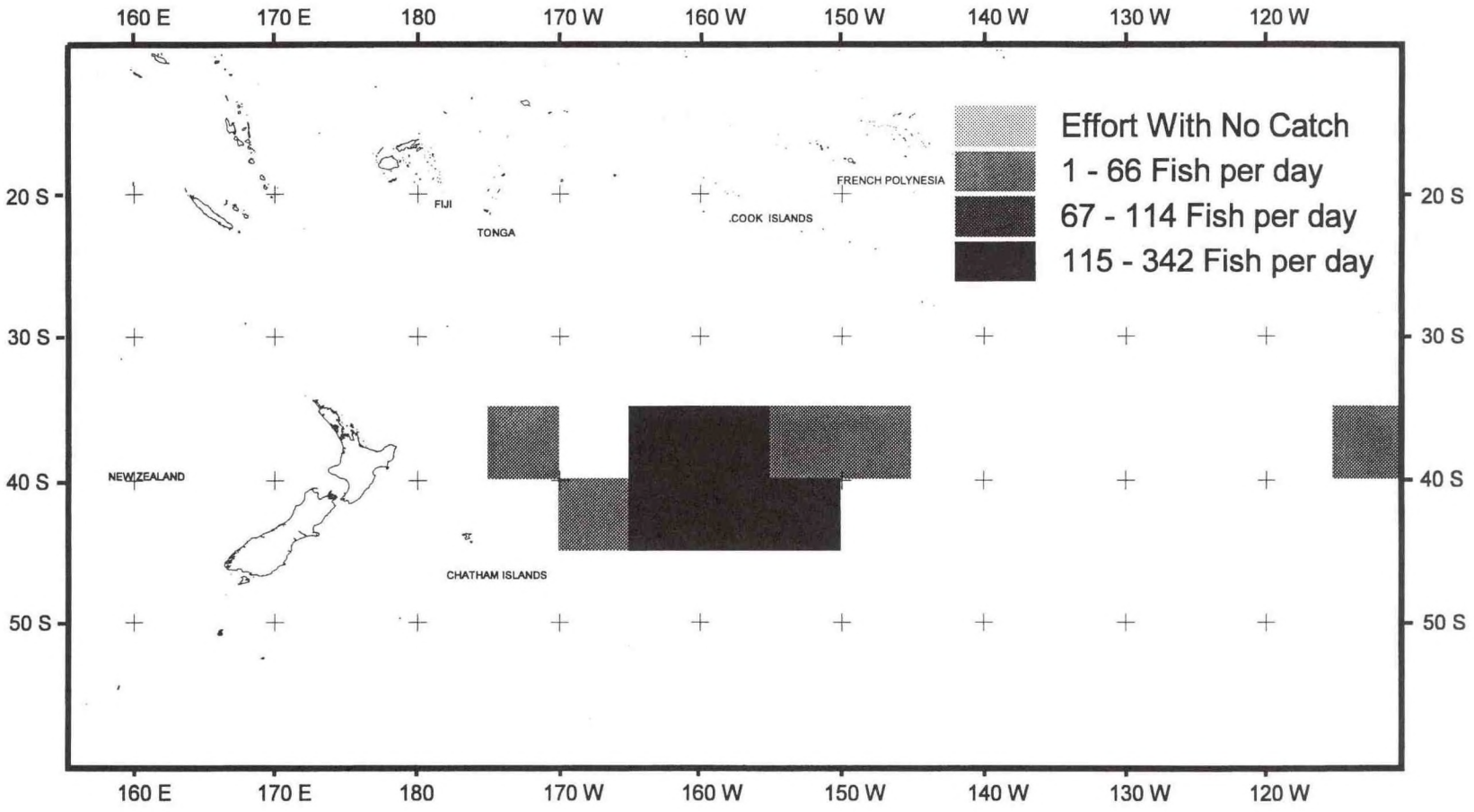

Figure 6d. Distribution of albacore CPUE by U.S. troll vessels in February 1999.

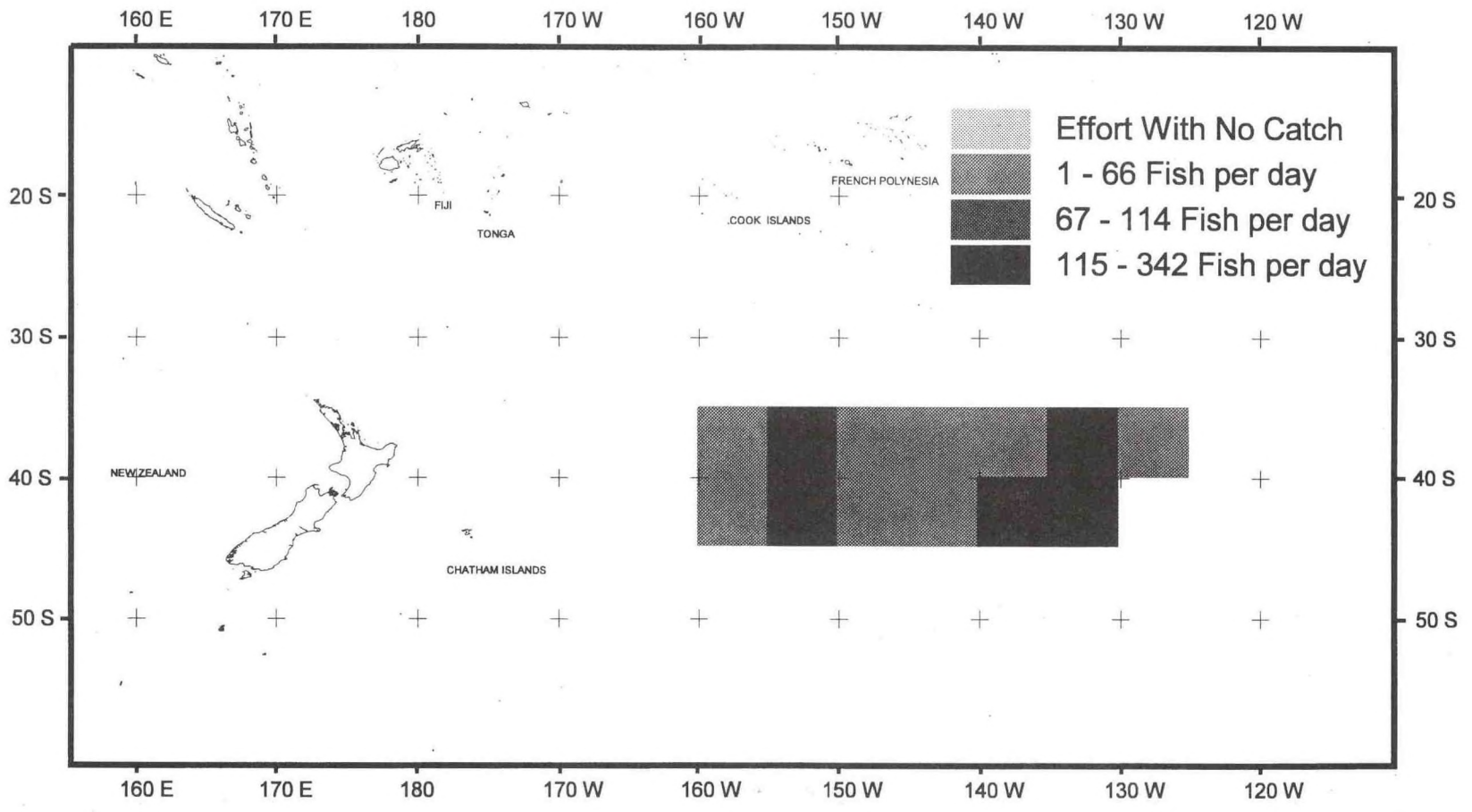

Figure 6e. Distribution of albacore CPUE by U.S. troll vessels in March 1999.

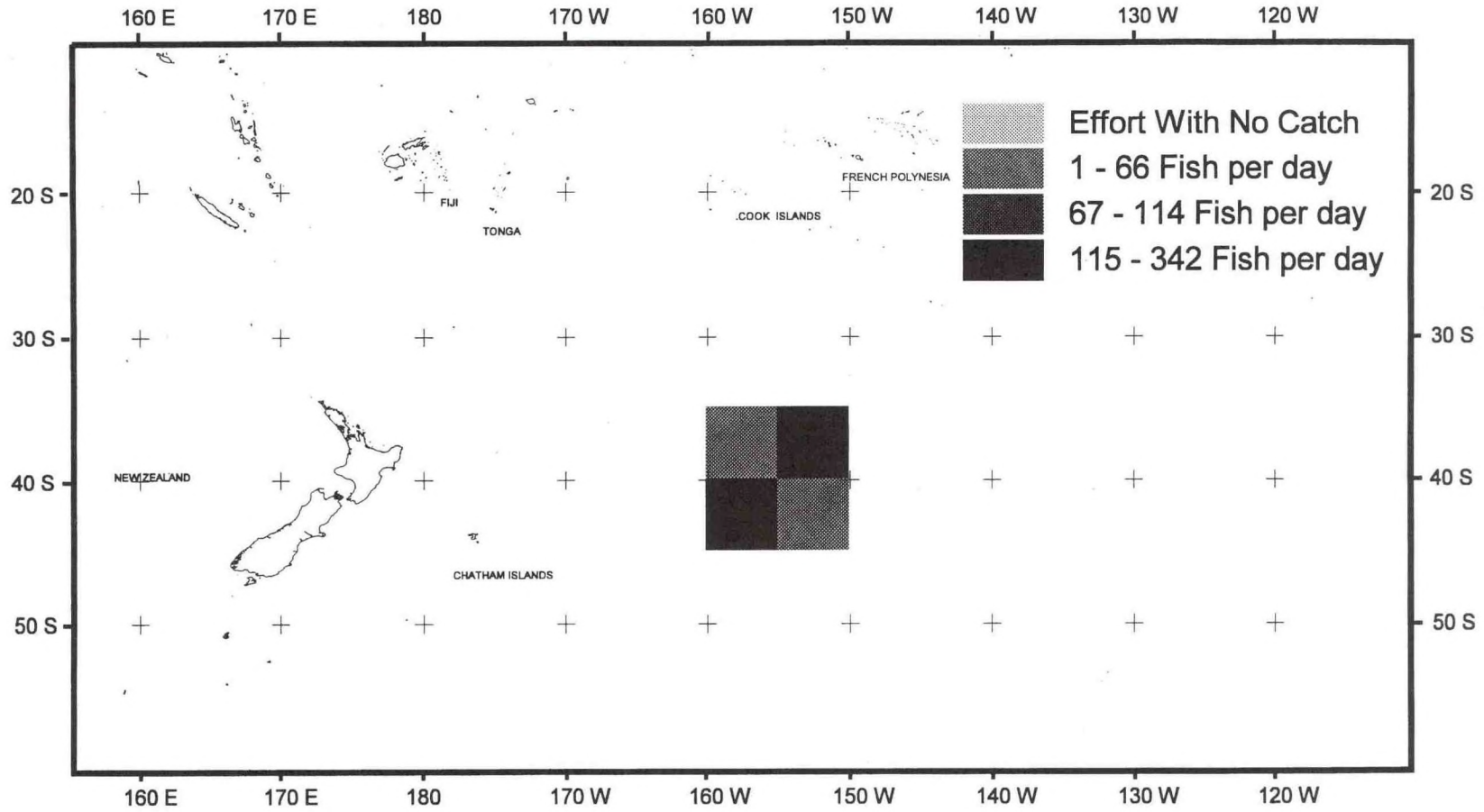

Figure 6f. Distribution of albacore CPUE by U.S. troll vessels in April 1999.

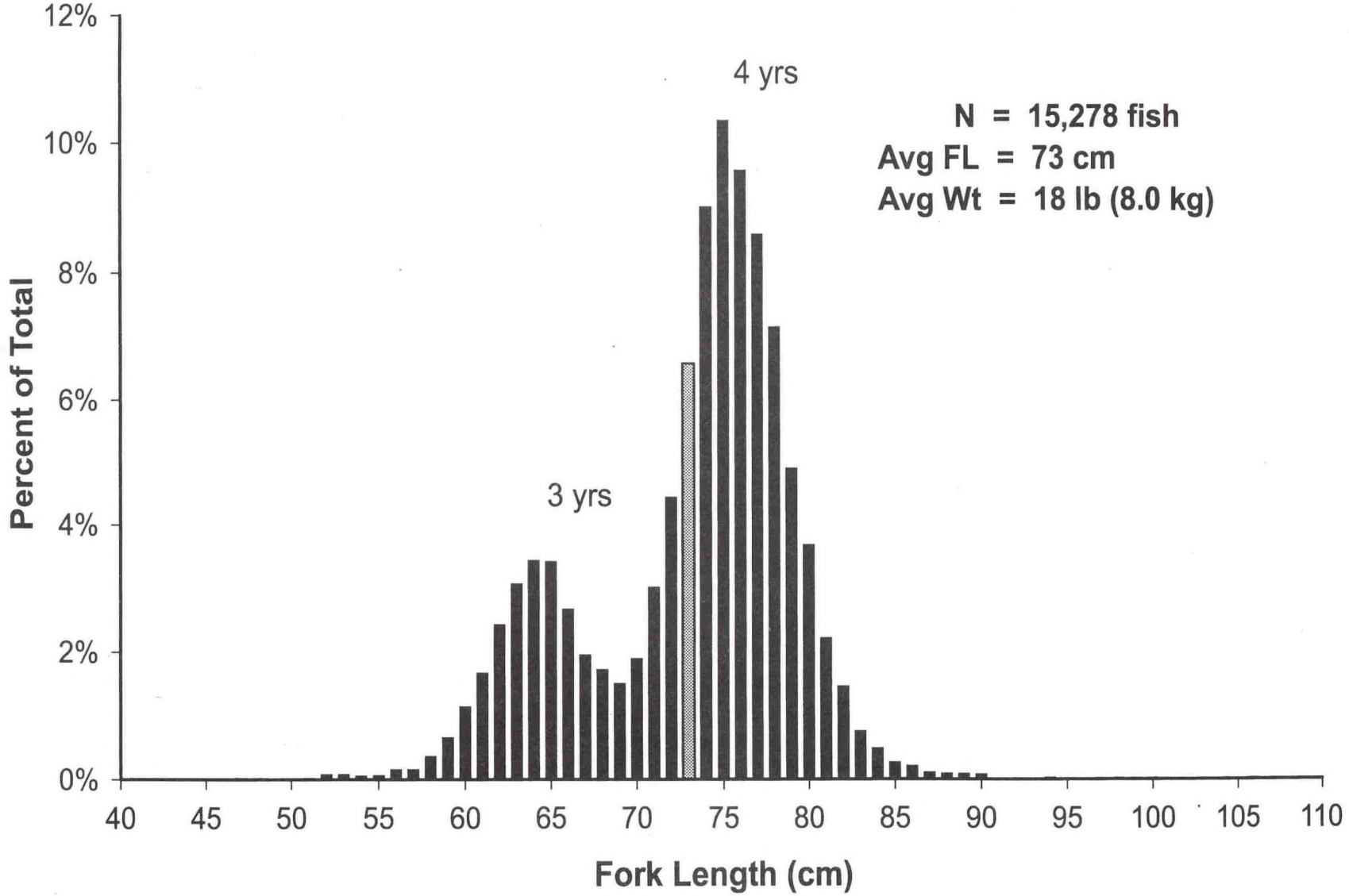

Figure 7. Length-frequency histogram of North Pacific albacore caught by U.S. troll vessels during the 1999 season.

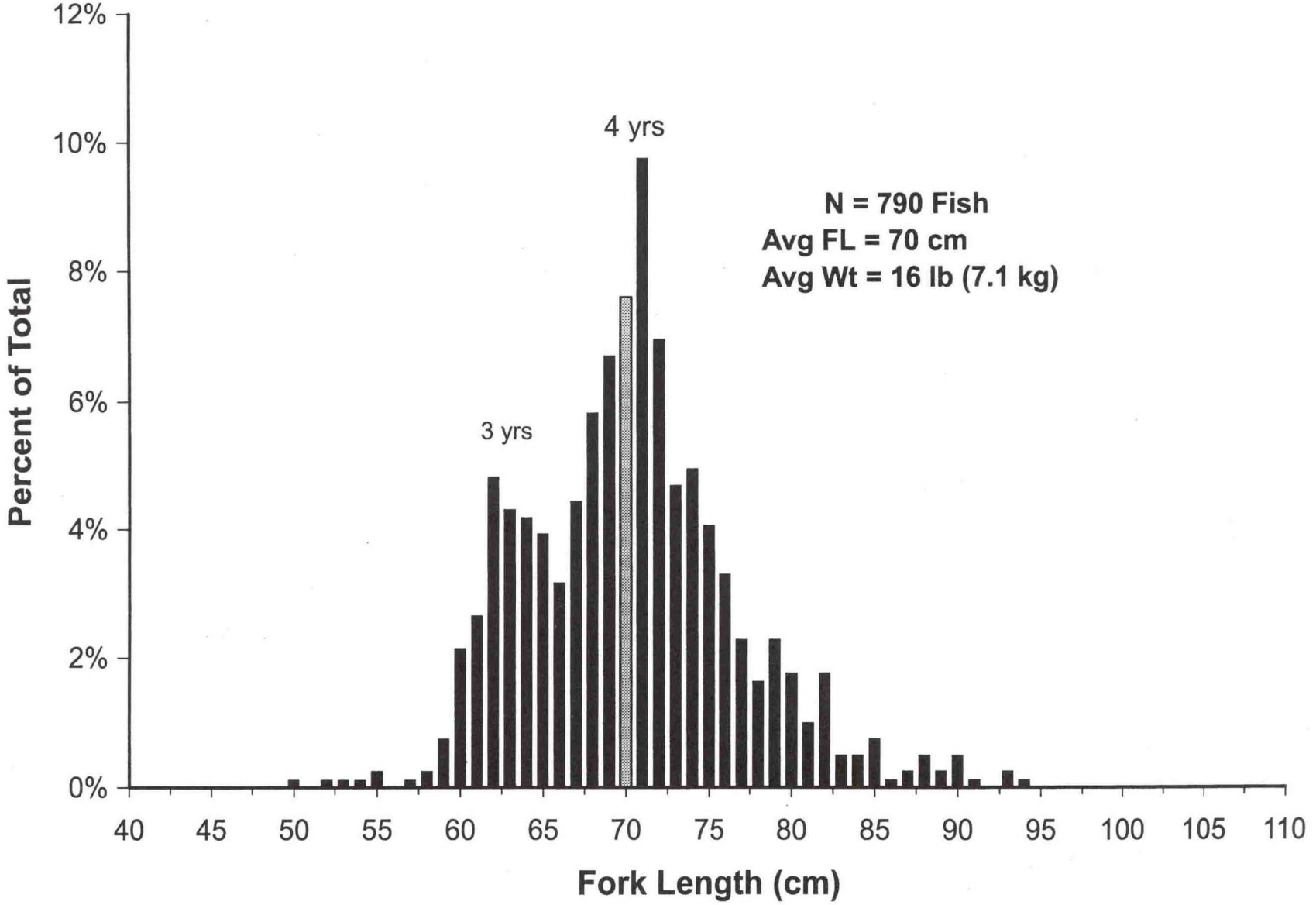

Figure 8. Length-frequency histogram of South Pacific albacore caught by U.S. troll vessels during the 1998-99 season.